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PATENTS FOR INVENTIONS.

ABRIDGMENTS
OF
Specifications
RELATING TO
PLATING OR COATING METALS WITH METALS.

PART II.—A.D. 1861-1866.

PRINTED BY ORDER OF THE COMMISSIONERS OF PATENTS.

SECOND EDITION.

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1872.

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PREFACE.

The Indexes to Patents are now so numerous and costly as to render their purchase inconvenient to a large number of inventors and others, to whom they have become indispensable.

To obviate this difficulty, short abstracts or abridgments of the Specifications of Patents under each head of invention have been prepared for publication separately, and so arranged as to form at once a Chronological, Alphabetical, Subject-matter, and Reference Index to the class to which they relate. As these publications do not supersede the necessity for consulting the Specifications, the prices at which the printed copies of the latter are sold have been added.

The number of Specifications from the earliest period to the end of the year 1866 amounts to 59,222. A large proportion of the Specifications enrolled under the old law, previous to 1852, embrace several distinct inventions, and many of those filed under the new law of 1852 indicate various applications of the single invention to which the Patent is limited. Considering, therefore, the large number of inventions and applications of inventions to be separately dealt with, it cannot be doubted that several properly belonging to the group which forms the subject of this volume have been overlooked. In the progress of the whole work such omissions will, from time to time, become *apparent*, and be supplied in future editions.

M. M.

PREFACE.

This volume is a continuation of the "Abridgments " of Specifications relating to Plating or Coating Metals " with Metals" already published, and brings the Abridgments to the end of the year 1866. From that date the Abridgments will be found in chronological order in the " Chronological and Descriptive Index" (*see* List of Works at the end of this book). It is intended, however, to publish these Abridgments in classes as soon as the Abridgments of all the Specifications from the earliest period to the end of 1866 have appeared in a classified form. Until that takes place, the reader (by the aid of the Subject-matter Index for each year) can continue his examination of the Abridgments relating to the subject of his search in the Chronological and Descriptive Index.

As the following paragraphs in the Preface to Part I. apply to this part also, they are quoted here:—

"The present series of Abridgments comprises only " those Specifications that relate to *processes* for coating " metals with metals. Applications in which processes " have not been expressly stated are omitted; but whenever " any reasonable doubt exists as to whether a Specification " should be embraced by the series or not, its " abridgment is included; thus the title 'Plating or Coating " Metals with Metals' has been strictly adhered to.

"All inventions that specifically relate to pickling or " otherwise preparing metals to be coated with metals are " included in this series. These abridgments also comprise " inventions that relate to combining metals that are " intended to coat other metals.

" Specifications that relate to *electrotyping* are not included " in this series; only those electro-depositing Patents " *which* refer to coating metals permanently with metals " *are comprised in this* work.

PREFACE.

“ Specifications that relate to ‘coating iron with steel, ‘by case-hardening the iron,’ are not included in this series.”

The very general appreciation that has been accorded by chemists to the new nomenclature has made it necessary to adopt chemical names in accordance therewith. This is done in the Subject-matter Index, by giving the new name (in *Italic*) after that which is derived from the body of the work.

The Abridgments marked thus (* *) in the following pages were prepared for another series or class, and have been transferred therefrom to this volume.

B. WOODCROFT.

May, 1872.

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INTRODUCTION.

It is deemed advisable to repeat here the explanation given in the Introduction to Part I. respecting the processes that have been employed to coat metals with metals.

The peculiarities of the principal processes may be classified as follows :—

1st. By amalgamation—using mercury as the means of ensuring contact between the underneath metal and the coating metal, the mercury being finally driven off by heat. This method is principally applicable to gilding and silvering.

2nd. By simple immersion of the article to be coated in an aqueous solution of a salt of the metal to be deposited.

3rd. By fusing a thin sheet of the coating metal on to the underneath metal with the assistance of a flux or intermediate fusible metal, the underneath metal being heated.

4th. By immersion of the article to be coated in a bath of the melted metal or alloy.

5th. By pressure and heat, as in the manufacture of tinned lead pipes.

6th. By casting a considerable thickness of the coating metal round the article to be coated, the article being placed in a suitable mould.

7th. By electro-deposition.

The paragraphs that follow are in continuation of the Introduction to Part I. :—

A.D.

1862. G. Gore, on June 19th, 1862, read a paper to the Royal Society, "On the properties of electro-deposited antimony." The three varieties of "active electro-deposited antimony" which the experimenter has succeeded in producing are obtained from the following solutions respectively :—1. Teroxide of antimony and hydrochloric acid. 2. Teroxide of antimony and hydrobromic acid. 3. Teroxide of antimony and hydriodic acid. Each of these deposits have unequal cohesion, and each possess the power of evolving heat. Arsenic (when deposited from the aqueous fluoride), exhibits a similar thermic property to that manifested by electro-deposited antimony. Silver, as well as antimony, unites during electrolysis with portions of the electrolyte. (See *Philosophical Transactions*, vol. clii., p. 323.)

1862. M.M. Becquerel and Ed. Becquerel, on September 6th, 1862, published certain researches on the "Electro-chemical reduction of cobalt, nickel, gold, silver, and platinum"; very weak electric currents were employed. For cobalt, an alkaline solution of its chloride is used. For nickel, an alkaline solution of its sulphate. For gold, a neutral solution of its chloride. For silver, a neutral solution of its nitrate, in conjunction with a positive silver electrode. For platinum, "a neutral and concentrated solution of this metal." (See *The Chemical News*, vol. vi., p. 126.)

1863. William Crookes, on February 19th, 1863, read a paper to the Royal Society, "On Thallium." The metal is readily obtained in the metallic state, from a solution of its sulphate, "by voltaic precipitation"; platinum terminals are used. Zinc, immersed in a solution of a salt of thallium, throws down metallic thallium. (See *Philosophical Transactions*, vol. cliii. p. 153; also, *Proceedings of the Royal Society*, vol. xii., No. 55, p. 438.)

1864. Dr. T. L. Phipson, on April 21st, 1864, communicated a paper to the Royal Society "On Magnesium," in which, amongst other points, he states that "magnesium precipitates nearly all the metals from their neutral solutions. When these are taken in the form of protosalts, even manganese, iron, and zinc are precipitated as black powders. *Aluminium* and *uranium* (and perhaps chrome) are only precipitated as *oxides*." (See *Proceedings of the Royal Society*, vol. xiii., No. 63, p. 218.)

1865. M. F. Weil, towards the end of 1865, put forward certain processes for covering metals with an adhering and brilliant coating of other metals. The baths are formed of *metallic* salts or oxides held in solution by a fixed alkali, A.D.

and usually in the presence of organic matters, such as tartaric acid, glycerine, or albumen; the precipitation of the oxide by the alkali is thus prevented. Iron or steel articles are immersed in the coppering bath in contact with zinc. The bath is renewed by precipitating the zinc in solution by means of sodic sulphide, and adding oxide or sulphate of copper. Various methods of bronzing in baths containing copper, made according to the above-described process, are employed, according to the surface to be bronzed. Tin, lead, and various alloys may be deposited upon metallic surfaces by means of these solutions. (See *Annales de Chemie et de Physique*, vol. iv., p. 374; also *The Chemical News*, vol. xiii., p. 1.)

1866. Dr. A. CLASSEN, in April 1866, published his method of estimating oxide of silver as metallic silver. Metallic cadmium is used in preference to zinc to reduce the silver from its solution as a sulphate. "Freshly-precipitated "chloride of silver may be reduced in the same way." (See *Journal für Praktische Chemie* for April 1866, p. 217; also *The Chemical News*, vol. xiii., p. 232.)

1866. M. PATERA, in June 1866, published his process for determining the quantity of bismuth in an alloy, by means of lead. The alloy is dissolved in nitric acid, and the bismuth is precipitated upon a strip of lead placed in the solution. (See *Les Mondes* for June 1866, p. 234; also, *The Chemical News*, vol. xiii., p. 291.)

1866. Dr. C. CALVERT, and Mr. R. JOHNSON, on June 21, 1866, read a paper to the Chemical Society of London upon the "Action of acids upon metals and alloys." The oxidation of a zinc surface causes it to be greatly attacked by the subsequent action of sulphuric acid; the strongest action upon zinc with an unoxidised surface occurred at a temperature of 130° C., and with tri-hydrated acid. Copper was most strongly attacked by mono-hydrated sulphuric acid at 150° C. The same took place with tin, but the chemical results of the action were different. The action of the three mineral acids is also given upon brass and bronze; nitric acid of specific gravity 1·14 dissolves the component metals in the exact proportions they exist in the alloy employed. The action of sulphuric acid in

A.D.

shown to be complicated and most interesting. These investigations have a direct bearing upon the preparation of metallic surfaces to receive metallic coatings. (See *The Journal of the Chemical Society*, vol. xix., p. 434.)

1866. Dr. **Boettger**, in August 1866, published "A new pro-" cess for giving brilliant coatings of colour to zinc by chemical means." The zinc is dipped for a longer or shorter time into a warm cupro-sodic solution. (See *Journal für praktische Chemie*, No. 9 for 1866; also *The Chemical News*, vol. xiv., p. 68.)

1866. M. A. **Commaille**, on October 1, 1866, read a paper to the Parisian Academy of Sciences "On the action of mag-" nesium on neutral metallic salts." Zinc is precipitated from its sulphate, cadmium from its chloride, bismuth (without other products) from its salts, tin from its chloride, lead from its chloride, copper from its sulphate, and platinum and gold respectively from their chlorides. In the case of the solution being perfectly neutral, other products besides the metal are thrown down. (See *The Chemical News*, vol. xiv., p. 188.)

1866. M. **Winckler**, in October 1866, published his method of precipitating the metal indium from its solution in hydrochloric acid, by means of an excess of zinc. The copper, lead, cadmium, and other metals are also precipitated, but they are separated by sulphide of hydrogen and barytic carbonate. (See *Journal für praktische Chemie*, vol. xciv., p. 414; also, *The Chemical News*, vol. xiv., p. 157.)

1866. M. **Schrötter**, in October 1866, published his plan of extracting indium from blende. The blende is roasted and then treated with sulphuric acid; from this solution the indium is precipitated directly by zinc, fractioning the precipitates. (See *Journal für praktische Chemie*, vol. xcv., p. 441; also, *The Chemical News*, vol. xiv., p. 157.)

PLATING OR COATING METALS WITH METALS.

PLATING OR COATING METALS WITH METALS.

1861.

A.D. 1861, January 7.—N° 43.

BAGLEY, William, and MINCHER, William.—(*Provisional protection only.*)—" Certain improvements in coating metals and " alloys of metals."

" Our invention consists in improvements in coating metals " and alloys of metals with lead, either pure or alloyed with " copper. The sheet or other article, if of iron or steel is first " scaled by the common process, and afterwards pickled in a " bath of diluted muriatic acid. It is then removed to a second " bath containing muriatic acid, lead, either white or metallic, " and arsenic." The sheet of iron is immersed into the said second bath " until it has taken up a coating of lead and arsenic, " which is intended to act as a flux in the next operation; this " is the removal of the iron to a bath of molten lead, or of lead " alloyed with a small proportion of copper, into which it is " plunged and allowed to remain a few seconds, or longer if " necessary, until a good and sufficient coating is formed upon " the iron, after which it is removed from the bath and cooled, " and finished if requisite by rolling. The combination of the " copper with the lead is effected by mixing the two metals " together, each in a molten state.

" In coating sheets of copper, zinc, or any of their alloys, the " process will be precisely the same with the exception of the " scaling-in substitution, for which we should employ the usual " cleansing by means of a bath of aquafortis."

[Printed, 4*d*. No Drawings.]

A.D. 1861, January 7.—N° 44.

BAGLEY, WILLIAM, and **MINCHER**, WILLIAM.—(*Provisional protection only.*)—" Certain improvements in coating metals and " alloys of metals."

" The sheet or other article, if of iron or steel, is first scaled in " the ordinary way, then pickled in a bath of diluted muriatic " acid, after which it is to be suspended in a bath consisting of " muriatic acid saturated with zinc, a slight excess of muriatic " acid being afterwards added to make the solution sufficiently " active. In the same bath, and attached to one pole of a battery, " is a piece of zinc, the article to be coated being connected to the " opposite pole, thus a coating of zinc is deposited upon the sheet, " forming a flux or base to receive the subsequent coating of lead " or alloy of lead and copper which is to be applied by immersing " the sheet in a bath of molten lead, or of lead alloyed with copper. " This process may also be effected without the employment of " the battery above-named by dipping the sheet in a solution of " chloride of zinc to form the flux before coating with the molten " metal.

" In coating articles of copper, zinc, or any of their alloys, the " first process, namely, scaling, will be dispensed with, simple " cleansing by means of a bath of aquafortis being employed in " its stead."

[Printed, 4*d*. No Drawings.]

A.D. 1861, February 8.—N° 317.

BANKS, THOMAS, and **MORGAN**, THOMAS. — " An improve- " ment or improvements in coating sheets or plates of iron with " lead or tin, or alloys of lead and tin."

" Our invention consists in the use of rosin, either alone or " mixed with tallow or palm oil or other fatty matter, or with sal " ammoniac or other flux, in place of the flux or layer of grease " ordinarily put on the surface of the melted metal in which " plates or sheets of iron are immersed to be coated."

The rosin is confined to that portion of the surface of the bath at which the iron sheet is immersed. According to one method, the rosin is confined in a box " having long narrow openings at " top and bottom, through the upper of which openings the sheet " or plate is introduced into the rosin ;" the said sheet passes *from the lower opening* in the box into the bath of melted metal,

the lower opening being "just immersed in the melted metal;" the rosin is preserved in a melted state by means of a steam casing that surrounds the box. According to another method, the bath is contracted in width near the top, and the rosin occupies this contracted portion. A third plan consists in using a bath with a partition extending across the top; the melted metal on one side of the partition is covered with rosin, and on the other side it is free from rosin. In the first two arrangements the plate is "passed
" into and withdrawn from the melted metal through the rosin;" in the third arrangement, the sheet or plate may be introduced at the part of the bath which is covered with rosin and withdrawn at the uncovered part of the bath, or the plate may be afterwards plunged into the uncovered part of the bath.

[Printed, 4*d*. No Drawings.]

A.D. 1861, February 12.—N° 353.

PARKES, Alexander. — (*Provisional protection only.*)—" Im-
" provements in electric telegraph conductors."

" When the conductors are composed of copper, in order to
" increase the conducting power, in place of drawing or rolling
" out a rod of copper to the desired size and section as heretofore,
" I employ one or more tubes, and place them one within the
" other, generally filling the centre with a solid rod of copper.
" I then extend the same by drawing or rolling; and when using
" silver in combination with copper as a conductor, in order to
" increase the conducting power, I proceed as follows: — I place
" a tube or rod of silver within a tube of copper, or I introduce
" several tubes or rods of silver into an outer tube or tubes of
" copper, or silver and copper may alternate. These are then
" drawn or rolled down to the desired extent, the object being
" to obtain silver within copper, and in place of the silver being
" prepared separately the tubes or rods introduced into copper
" tubes may be first electrotyped or coated with silver before
" introducing them into the outer tube of copper; or copper
" may be deposited on to silver, and in that condition drawn
" or rolled. It is desirable that the copper and the silver used
" should be as pure as may be, though the same may be alloyed
" with each other, and to some extent with other metals."

[Printed, 4*d*. No Drawings.]

A.D. 1861, March 7.—Nº 579.

EVANS, THOMAS WILLIAM. — " Improvements in telegraphic " cables."

In constructing electric telegraph cables a conductor is employed, which is composed of several wires drawn, at one operation, from pure metal.

" Upon the cylindrical conductor thus prepared I superimpose, " to guard against the possibility of any defects in the metal, " by means of a galvanic battery, and a bath containing either " copper or gold in solution, a slight coating or plating of pure " copper or gold (the latter I prefer). By thus presenting a " surface of absolutely pure metal the facility of electrical trans- " missión is sensibly increased, whilst the danger of any chemical " action upon the conductor from the contact of the insulation " is entirely avoided." This metallic coating is used for " sub- " marine and ordinary telegraph cables."

The insulation of the above-mentioned cables is accomplished by means of three distinct coats, " an interior one of pure caoutchouc, " a second of gutta percha, and a third of caoutchouc."

[Printed, 4*d*. No Drawings.]

A.D. 1861, March 13.—Nº 619.

CIMEG, JOHN. — " Improvements in silvering glass and other " surfaces." One application of this invention is to produce a sheet " of plated copper."

To carry out this invention " a mixture of ammonia, nitrate of " silver, with a solution of Rochelle salt (tartrate of potash and " soda)," " is applied to the surface of glass to be silvered, and " after a short time the silver is deposited on the glass as a bright " film." " When dry the silvered surface is varnished."

" When a surface of glass has been silvered as above described, " a layer of copper may be deposited over the silver by the " ordinary electrotype process, or otherwise, as is well understood. " I do not, however, prefer to do this when the object is to obtain " a silvered glass, but in some cases I deposit a considerable " thickness of copper on to the silver, and then strip the copper " and silver together from the glass, which will be done with " facility when the coating of copper is thick. In this manner " a sheet of any size of plated copper may be produced, plates " of other non-absorbent materials (which will not act chemically

" on the silver solution) may be coated with silver in the " same manner as plates of glass. When it is desired to give " a metallic and conducting surface to an article which it is " desired to electrotype, say, for example, a medallion of wax or " gutta percha, I silver it as already described, sufficient of the " silvering mixture being employed to cover every part of the " surface."

[Printed, 4*d*. No Drawings.]

A.D. 1861, March 22.—N° 726.

GRAHAM, James.—(*Provisional protection only.*)—" Improve" ments in preparing and annealing iron wire."

"This invention has for its object improvements in preparing " and annealing iron wire. For these purposes coils of iron " wire as they come from the wire drawer are heated in a reverbe" ratory furnace, atmospheric air being excluded as far as it con" veniently can be, and when the wire is at a low red heat it is " withdrawn from the furnace, and immediately plunged into a " solution of galvanizing refuse, called by some sal ammoniac " skimmings or sal ammoniac dross, such solution being pre" pared by boiling such dross or skimmings, or in place thereof " a solution of carbonate of potash or soda, or of caustic potash " or soda, or chloride of sodium, or water may be employed. It " is preferred that the solution should be in a boiling state, but " it is not essential that it should be in a heated state for all the " solutions. When the wire is to be again drawn, after the " annealing, the wire is well washed in boiling water, and dried, " then drawn. When the wire is to be coated with other metal, " it is desirable to retain the wire in the solution used, as above " mentioned, for quenching it, and to boil the wire therein for " some time before passing the wire into the melted zinc or other " metal used for coating."

[Printed, 4*d*. No Drawings.]

A.D. 1861, April 26.—N° 1055.

MARSHALL, John.—" Improvements in preventing the fracture " of metals from crystallization."

" My invention consists in coating, covering, or surrounding " all metals, whether simple or compound, which, when in use, " are in a state of motion, accompanied by vibration from per" cussion or any other cause, with a coat or covering of a simple

" or compound metal, or other material of a softer nature than " that of the metal to be protected from crystallization, and in " again coating, covering or surrounding the core, protected as " described, with any metal that may be thought fit that is hard " enough to form the frictional or outer surface."

In applying this invention to a railway carriage axle, a rod or core of wrought iron or steel has screw threads cut upon its ends; a tube of larger internal diameter than the diameter of the rod is slid over the rod, and a coat of soft metal is run in between the rod and the tube, " both tube and core being raised to a " temperature equal to that of the melted soft metal." Suitably-shaped nuts are kept screwed upon the above-mentioned screw threads during the cooling, and the contraction of the tube " sets and binds all tight."

When the invention is applied to shafts at the bearings only, the outer hard metal tube is fastened to the core by means of under cut collars. Having put the tube in its place in the rebate of the collar already fixed, the soft metal is run between it and the core, and the remaining collar is shrunk on hot.

Other applications of this invention are set forth.

[Printed, 8*d*. Drawing.]

A.D. 1861, May 13.—N° 1214.

BELL, THOMAS.—(*A communication from Louis Le Chatelier.*)— " Improvements in the decomposition of the compounds of " aluminium and in coating metals with aluminium or its alloys."

The anhydrous double chloride of aluminum and sodium is melted, and the electrodes of a galvanic battery are suitably placed therein. The article to be coated forms the negative electrode, and the soluble positive electrode may be of aluminum or of a composition of carbon and anhydrous alumina. "This composi-" tion is compressed in a mould of a cylindrical or other suitable " form, then calcined in a close vessel before being used. This " process produces the chloride of aluminium, with the chlorine " which is disengaged by the action of the electric current."

" When a positive electrode composed of carbon mixed or not " with alumina is employed, small pieces of carbon become " detached during the operation and soil the bath; to remedy " this the electrode may be enclosed within a porous earthen " vessel, which is placed in the bath containing the double " chloride."

The electrolyte may consist of a mixture of the above-mentioned double chloride with cryolite or of cryolite alone; these electrolytes, however, are only fusible at a high temperature.

"A deposit of aluminium on copper having been effected, if " the piece be heated at a suitable temperature, the alumina and " copper combine and the surface of the piece of metal will be " converted into a bronze of aluminium."

[Printed, 4*d*. No Drawings.]

A.D. 1861, June 12.—N° 1503.

CALLAUD, Jean Armand.—" Improvements in the construc- " tion of electrical piles."

One of the galvanic arrangements set forth in this Specification may be "used for gilding, and all operations within the range of " galvano-plastic dissolvants, by electrical means."

"The modifications and improvements which I have made in " the elements of piles have for special objeet" [object ?] "the " suppression of the porous vase separating the saline liquids " and obtaining constant current without the necessity of so " often renewing the elements and the alimentary and stimulating " liquids; also the application of these elements to all sorts of " uses, either for telegraphs, galvano-plastic operations, gilding, " or electro-motors."

In charging the arrangements treated of, the heavier liquid, whether it be the sulphate of zinc or the liquid nearest to the negative metal, is first poured into the containing vessel, and the positive or negative metal, as the case may be, is placed therein; the solution which is the other liquid component of the battery, is next carefully poured on to the liquid already supplied, and the other metallic plate, suitable to the solution used, is placed in this upper liquid.

An arrangement described in the Final Specification and specially adapted to electro-gilding, consists of "an openwork " cane basket" "in which are placed the metallic ingredients " which are to be dissolved by the galvano-plastic process." The article to be coated rests on the negative plate of the arrangement and liquids suitable to the operation required are employed. Another arrangement, also described in the Final Specification and suitable for similar operations, is furnished with a partition.

[Printed, 1*s*. Drawing.]

A.D. 1861, June 18.—N° 1567.

NEWTON, William Edward.—(*A communication from George Beardslee.*)—" Improvements in electro-magnetic engines."

1st. " In the frotteur wheels of magneto-electric or electro-" magnetic engines," " making the bearing surfaces of the two " conductors (which bear upon and act in combination with a " wheel composed of metallic segments separated by insulating " segments) of greater extent than each insulating segment, so " that one metallic segment shall not pass from contact before the " next comes in contact." If the terminal wires of the helices of the above-mentioned magneto-electric or electro-magnetic engines " were directly connected to close the circuit," " as required for " use, say with a vat interposed and containing a solution for " electrotyping," it follows " that no beneficial effect could be " produced, because each succeeding impulse would undo what " the preceding had done. Now by the arrangement of the " frotteur plate the impulses which are alternately induced in " opposite directions are thereby resolved into one and the same " direction." The purpose of this part of the invention, is to eliminate a continuous current from magneto-electric or electro-magnetic engines, that is available " for electrotyping or other " purpose requiring the current to be in the same direction as if " induced by a galvanic battery."

2nd. " Connecting the cores of spools, coils, or helices in mag-" neto-electric engines by a ring of soft malleable cast iron, or " wrought iron." The said cores can thus act successively, in pairs, as closed armatures.

[Printed, 1*s*. Drawing.]

A.D. 1861, July 15.—N° 1774.

TAYLOR, Rees, and PRICE, Thomas.—" Improvements in " the manufacture of tin and terne plates."

" Our improvements commence at the end of that stage of the " process after the use of the 'washman's' pot, and is as follows: " —After the operation at the 'washman's' pot the plates are " passed on to another pot, which we call the 'finishing' pot. " This pot contains a mixture of tin or terne metal heated up to " the melting point, and having its surface covered with fat or " melted grease to retard oxidation. Within this pot we place a " *pair of rolls so disposed* as to work within the metal, and

" immersed to such a depth that the line joining the centres of " the rolls (that is, the line of pressure,) shall be just a little way " above the surface of the melted metal." "The rolls have the " usual means for increasing, diminishing, and regulating the " pressure, and underneath them are fixed guides or ways for " the purpose of conducting the plates between them. The plates " after leaving the 'washman's' pot as passed into the last-" mentioned finishing pot, received into the guides, and passed " between the rolls, which are driven by suitable power, and are " then removed by tongs or other suitable machinery. The " action of the rolls when so disposed and arranged in the tin or " terne metal is such as to spread the metal equally, smoothly, " and thinly over the surface of the plates, thus obviating any " future operations, and enabling us to use more lead with " the tin, to dispense with the use of a large quantity of grease, " and to make larger plates more quickly and economically than " at present."

[Printed, 4*d*. No Drawings.]

A.D. 1861, July 25.—N° 1868.

KELLY, Robert, and SHAKESPEARE, John.—(*Provisional protection only.*)—" New or improved machinery to be used in " the manufacture of tin plates and terne plates, and iron plates " coated with lead."

1st. A machine for cleaning the iron plates prior to their immersion in the bath of melted tin.—Three pairs of rolls are placed horizontally; the first and third pair are guide rolls and each roll of the middle pair has a brush on its cylindrical surface. A hopper containing sand and water " is situated over the upper " roll of the middle pair," and the lower roll of the said pair " dips in a trough also containing sand and water." During the action of the machine both sides of the plate are scoured by the above-mentioned brushes, and, as the plate leaves the rolls, it passes between certain fixed brushes, " and is thereby cleaned of " all adhearing sand."

2nd. A machine for cleansing the plates from grease and polishing their surfaces after they are tinned.—Nine pairs of equal sized wooden rolls are situated horizontally; the odd pairs are guide rolls and the even pairs cleansing and polishing rolls. The first pair of cleansing rolls is covered with carpeting, the other cleansing rolls are covered with sheepskins with the wool on. A wiper of carpeting is placed in front of the series of rolls and another wiper of sheep skin at the end of the said series. Each pair of cleansing rolls has a hopper to supply "sharps," and between each pair is a brush to brush them off. The plate, being passed through the first wiper into the machine, comes away from the last wiper thoroughly cleaned and polished.

[Printed, 4*d*. No Drawings.]

A.D. 1861, August 14.—N° 2023.

BROOMAN, Richard Archibald.—(*A communication from Martin Miller.*)—(*Provisional protection only.*)—" Improvements " in coating wire with copper, silver, gold, or other metal or " alloy, in order to prevent oxidation."

The wire is conducted into and out of the electro-depositing bath by means of certain pulleys; it then passes through water and is dried and wound on a roller. The first pulley is said to be connected to the "positive pole" [negative pole?] of a galvanic battery, and the coating metal to the "negative pole" [positive pole?] of the said battery.

The copper solution consists of carbonate of copper dissolved in an aqueous solution containing "cyanide of sodium (cyan-kali)" [cyanide of potassium?] and carbonate of soda or potash; the said alkaline solution is boiled, "the carbonate of copper is then " added, and the mixture is kept boiling until strong ammoniacal " vapors are given off; the mixture is then removed from the " fire and allowed to cool, and when cool is fit for use."

" For silver, I dissolve silver in aquafortis, and dilute with " water; into the solution I pour slowly a solution of common " salt. The precipitate obtained is then mixed with a solution " of cyanide of sodium (cyan-kali)."

" For gold, I dissolve gold in aqua regia, and evaporate to dryness, and the residue is mixed with a solution of cyanide of " sodium (cyan-kali)."

" The foregoing examples will be sufficient to enable a chemist " to prepare a bath or solution for coating wire with tin, brass, " or any other suitable metal or alloy."

[Printed, 4*d*. No Drawings.]

A.D. 1861, September 5.—N° 2213.

BENNETT, Frederick.—" An improved method of coating " the interior surface of lead and lead composition pipes with tin " or its alloys."

" My invention relates to those lead or lead composition pipes
" which are manufactured by hydraulic pressure, and consists in
" forming the core or mandril over or round which the pipes are
" formed hollow or tubular, and in causing the tube or hollow
" in the mandril to communicate with a reservoir or supply of
" tin or alloy of tin, the level of which is maintained at such a
" point that the tin will just overflow the lip or upper end of the
" tubular mandril. As the leaden tube is formed over the hollow
" core or mandril, so it receives a uniform coating on the interior
" of the tin or tin alloy, which is kept flowing over the lip of the
" mandril."

" Upon the hydraulic press being set in motion, lead is forced
" up between the die" " and the mandril in the ordinary manner;
" when the pipe reaches the lip," " liquid tin is spread over its
" internal surface, and the coated pipe passes on to the solid
" portion of the mandril, the lead and tin become consolidated,
" and the finished pipe is carried away in the ordinary manner."

[Printed, 8d. Drawing.]

A.D. 1861, November 5.—N° 2784.

BOUSFIELD, GEORGE TOMLINSON.—(*A communication from Jabez Ellis Walcott.*)—" Improvements in electro-plating or de-
" positing metals."

A process " by which copper may be deposited on and made to
" adhere to the surface of iron and other metals, soluble in sul-
" phuric acid, without the use of sulphate or cyanide of copper,
" and which shall be less expensive than where either of these
" substances are used, and also free from " poisonous effects, " is
" a great desideratum in the arts. This desideratum is attained,
" and the before-mentioned inconveniences, as well as the great
" expense heretofore incurred are avoided by the improved process
" which I will now proceed more particulary to describe.

" A solution of fused cyanide of potassa of great strength is
" employed in connection with a powerful galvanic current; into
" the cyanide of potassa bath there are plunged, in the first
" place, two metal plates, the one of iron and the other of copper,
" and the terminals of the battery are connected with the plates.
" When the copper commences to be freely deposited on the iron
" plate this plate is removed, and the article to be covered with
" copper substituted for it, being similarly connected with the
" battery terminal."

The solution is worked hot, and one cell of a Bunsen's battery is employed to charge the liquid with copper. Considerable galvanic power is required to commence the deposition of the copper upon the iron, but after that, "it is simply necessary that the " surface of zinc in the battery be about equal to the surface on " which the deposit is being made."

[Printed, 6*d*. Drawing.]

A.D. 1861, November 23.—N° 2944.

WEEMS, JOHN.—" Improvements in the manufacture of metallic " tubes, and in coating or plating metals."

1st. " The manufacture of metal tubing."—Zinc tubes, made either by overlapping and brazing the contiguous edges of zinc strips or by means of a die, are " coated or plated with metal, " which is done by immersing them in suitable chemical solutions, " and precipitating the metal or metals with the aid of a galvanic " battery;" the zinc cylinder is annealed " preparatory to forming the same into tubes, and with a view of rendering the metal " ductile."

2nd. " The coating or plating of zinc mouldings, beadings, " astragals, brackets, and other struck work."—The zinc is annealed or worked in a heated state, and " in the subsequent " treatment of these details the surfaces may be plated with different metals, and these, with the combination of colour, afford " a wide scope to the decorative artist."

The processes indicated herein are also applicable to the decoration of furniture, picture frames, gaseliers, and to the production of window blinds; in the latter case perforated sheet zinc is electro-silvered or electro-gilt, or both, and thence damaskeened, colour may also be combined with the metallized surfaces. Sheets of zinc coated with metal may be used in the construction of cisterns.

3rd. " The manufacture of chemical and other vessels."—The said vessels are made of zinc, or of a zinc alloy, and they " are " subsequently rendered acid-proof by coating them with any of " the metals or metallic alloys which are capable of being precipitated by galvanic agency or other equivalent means." In some cases a transparent varnish may be employed to protect " the " plated surfaces, so to prevent the tarnishing of the metallized " surface."

[Printed, 4d. No Drawings.]

A.D. 1861, December 7.—Nº 3074.

FEARN, THOMAS, and COX, THOMAS, Jun.—(*Provisional protection only.*)—"The application of certain electro-deposits to the "coating or finishing of the stretchers, ribs, and other metal "portions of umbrellas and parasols."

Our invention consists in the application to the coating or "covering (by the agency of electricity) of the metal portions of "umbrellas and parasols with tin or alloys that will readily mix "and amalgamate with tin, so as not materially to affect the "white or bright colour natural to tin so deposited, nevertheless "we purpose that tin shall form the principal base of our deposit. "The metal portions of umbrellas and parasols thus treated will "present a clean, neat appearance, and not liable to corrode or "oxidise, as the iron and steel portions of such articles are now "subject to."

[Printed, 4*d.* No Drawings.]

A.D. 1861, December 12.—Nº 3111.

SEARLE, RICHARD.—"Improvements in the treatment, prepara-"tion, and combination of metals used for sheathing ships "and marine erections, also for roofing buildings and other "purposes."

1st. The application of amalgamated zinc, or of amalgamated galvanised iron, to the above-mentioned purposes.—The zinc is immersed in a bath of dilute sulphuric acid "in which a portion "of mercury is also placed," the mercury is then rubbed over the zinc surface with a cloth, the plate or other article of zinc still being immersed in the bath; when the amalgamation is complete, the excess of mercury is removed and the prepared zinc is ready for use. "When the zinc or other metal so prepared is applied to "the sheathing of ships, I place a portion of copper, either in "partial or absolute contact with it, in such a manner as to pro-"duce a weak galvanic circuit, the strength of the current being "determined by the relative proportions of the two metals so "employed."

2nd. "A method of keeping the bottoms of iron ships or vessels "clean by the application of such proportions of copper to their "internal or external surface as shall cause a weak galvanic action,

" but not sufficient to exercise a destructive influence upon the " metal of which they are composed."

[Printed, 4*d*. No Drawings.]

1862.

A.D. 1862, February 11.—N° 359.

JOHNSON, RICHARD.—" Improvements in welded wires used " for telegraphic and other purposes."

" My invention has for its object the strengthening of those " joints which are produced by welding, and the maintenance of " a continuity should the welding give way. These advantages I " propose to attain by protecting the said joints with a metal " covering, and this I form by winding wire or other such mate- " rial around the joint, so that should the welding break, the said " wire will still constitute a connexion or conducting medium. " By a subsequent process of galvanizing the whole becomes " soldered together."

The Specification describes, and the drawings show, flat wire coiled around the welded joint and for some distance on each side thereof. " If desired, in order to gain additional strength, I gal- " vanize the whole by the usual process. By the above-described " arrangement the junction of the wires is materially strengthened, " and one object of my invention is thereby attained; but sup- " posing that the said wires separate at or near the welded part, " then the protecting wire " " will be drawn out in a spiral " [helical ?] " form," " and the continuity will be preserved, so as " to afford the conducting medium required for telegraphic " purposes.

" My invention is, however, also applicable to other cases " in which welded wires are used, such, for instance as wire " fencing."

[Printed, 6*d*. Drawing.]

A.D. 1862, February 22.—N° 469.

CHAVASSE, HORACE, MORRIS, TIMOTHY, and HAINES, GEORGE BATTISON.—" An improvement or improvements in the

" manufacture and ornamentation of metallic bedsteads, part of " which is also applicable to other articles."

1st. " The preparing and coating iron with tin or lead, or both " combined, and afterwards electro-depositing upon the same " brass, bronze, German silver, metal, or other metallic alloy, " and manufacturing such iron either before or after it is so pre-" pared " into the above-mentioned articles.—The iron is first freed from scale, passed " through a draw bench plate," coated with tin or lead, and again passed " through the draw bench " plate ;" it is then bright and in a condition to receive the electro-coat.

2nd. " Using zinc either upon or as a substitute for iron, and " producing thereon a surface " " for the reception of " an electro-coat.—The iron rods are covered with sheet zinc, " the edges of " the zinc being well soldered together either before or after being " placed upon the iron ;" the covered iron may be drawn " through " a draw bench plate ;" the electro-deposit may then be applied. The tubes may be made of zinc or alloy and electro-coated. The cast ornaments are made to unite the rods or rails and are then electro-coated. Electro-coated sheet metal may be used for the ornaments.

3rd. The application of electro-coated " stamped, spun, or " drawn zinc or sheet tinned ornaments " to increase the size and beauty of the above-mentioned articles.—Shell ornaments, made by the above operations in two or more parts, are soldered together and suitably fitted in their places ; they may be electro-coated either before or after fixing, and finished by lacquering, burnishing, or polishing. The cavities may be filled with gypsum or any similar substance.

[Printed, 4d. No Drawings.]

A.D. 1862, March 22.—N° 807.

HENRY, Michael. — (*A communication from the " Société " Coignet pere et fils et Compagnie.*")—" Improvements in kilns, " ovens, and furnaces."

1st arrangement.—The kiln is constructed with a floor, which has numerous inlet holes. In the arrangement for cooling, " open-" ings with moveable covers are formed in the sides and roof for " the passage of air."

2nd arrangement.—One of the furnaces made according to this *arrangement*, described in the Final Specification, and shown in the drawings, is "for coating iron with fusible metal." The vessel containing the molten metal is open at the top, and rests on a bridge or arch within a chamber, the sides of which slope inwards towards the top. The fire-places are shut in by air-tight doors. The ash-pits are closed by plates, in which are air-tight doors, furnished with cocks, valves, or like contrivances, "which " afford the only means whereby atmospheric air can obtain " access to the fire, so that the draft may be regulated with pre- " cision." There are two fire-places, one opposite to the other, they are underneath the bridge or arch; their flues are at each angle of the furnace, and lead into the above-mentioned chamber; there are also flues midway between those at the angles of the furnace. " These flues are fitted with valves or registers." The heated products of combustion pass through the flues at the angles into the chamber, and thence through the midway flues into the chimney.

3rd arrangement.—In this kiln the products of combustion enter the main chamber at the upper part of the materials, pressure is maintained upon the products of combustion, and the said products heat the materials temporarily placed in the hopper or shoot that charges the main chamber.

[Printed, 1*s*. 6*d*. Drawings.]

A.D. 1862, March 24.—N° 815.

MOREWOOD, Edmund, and WHYTOCK, Andrew.—" Im- " provements in the process of coating metals, and in the " apparatus employed."

A mixture of rosin and tallow is employed " as a flux on the " surface of melted lead or tin or alloys of those metals," " by " using two or more coating baths worked in connection by the " aid of machinery, which causes the sheets to pass from one " bath to the other whilst in the process of coating." The above mentioned mixture is also employed " on the surface of alloys " of lead and antimony or bismuth, with or without tin, and of " tin or alloys of tin " when using rollers to assist in the coating process. By means of suitably-placed rollers, in combination with guides or an endless chain, the end of the sheet which goes into the metal first is caused " to come out first from the melted metal." When zinced iron is coated with such an alloy of tin and lead as *melts at a lower tem*perature than zinc, the bath containing the alloy is divided by a bar, so as to cause the sheets to enter on one side of the said bar and to make their exit on the other side; tin or its alloys may be worked in a similar manner by means of rollers or guides; the spent flux mixed with sal-ammoniac is used on the surface of the above-mentioned easily melted alloy. A roller or rollers in combination with guides conducts the sheets from the first to the second coating bath. "Sometimes we use " hollow tubes penetrating or running into or through the bath " of coating metal in order to convey the heat of the fire " more advantageously to the coating metal than in the ordinary " mode."

In the above processes rosin alone may be used instead of rosin and tallow, and the flux may be used on the entrance side of the bar or division of the bath only.

No. 2235 (A.D. 1859) is alluded to in this Specification.

[Printed, 4*d*. No Drawings.]

A.D. 1862, April 1.—N° 919.

MADGE, Henry Joseph.—" Improvements in coating iron " sheets or plates to be used as a substitute for tin or terne " plates."

"The invention has for its object to dispense as far as possible, " and sometimes entirely with the use of tin for coating such " metallic sheets or plates, and to employ instead thereof an " amalgam or alloy of metals, which is much cheaper than tin. " This amalgam or alloy, one of the principal ingredients in which " is antimony, is not liable to be injuriously affected by the atmo- " sphere, and will adhere firmly to the iron, and will conseqnently " protect the metallic sheets or plates as effectually as tin, so that " such sheets or plates may be used for many of the purposes for " which tin or terne plates are now employed. For some pur- " poses I am enabled to dispense entirely with tin, and the alloy " I employ for coating the plates is composed principally of lead " and antimony. Bismuth, metallic arsenic, tungsten, zinc, or " spelter may also be introduced into the alloy if desired instead " of an equivalent quantity of lead, but their addition thereto is " not absolutely necessary for the purposes of my invention, as " an alloy of lead with antimony alone, or with the addition of " a small proportion of tin, will be found to adhere with great "tenacity to the surface of the iron or steel plates, and such "coated plate may be beaten or hammered, and used for many "of the purposes for which ordinary tin or terne plates are now "employed."

The chief feature of this invention consists in the use of antimony as one of the metals in an alloy for the above purposes. In the Final Specification, an alloy of tin and antimony is stated to be superior to tin alone for coating iron or steel plates.

[Printed, 4*d*. No Drawings.]

A.D. 1862, April 17.—N° 1127.

ABEL, CHARLES DENTON. — (*A communication from Henri Catherine Camille de Roulz and Anselme Louis Marie Fontenay.*)— "Improvements in the manufacture and production of certain "alloys containing cadmium."

The first series of alloys consists of silver with cadmium, or silver and copper with cadmium, and is applicable to wire drawing. The proportion of ingredients in the silver and cadmium alloy approaches that of the chemical equivalents of the respective metals.

The second series of alloys consists "of gold with cadmium, "or of gold and silver with cadmium, or of gold, silver, and "copper with cadmium." Each of these alloys are malleable, ductile, and of a green or yellowish-green colour; they are applicable "to jewellery and the manufacture of wire by drawing."

"All the herein-before described alloys of gold or silver are "applicable to the processes of covering or plating."

"Mode of operation.—Each of the above-named alloys should "first be carefully melted down in a covered brasque crucible, "or in any vessel having a carbonaceous lining, and should be "remelted subsequently in an ordinary crucible, or by preference "in a graphite crucible, together with charcoal or with resin dust "and borax. If, notwithstanding the precautions taken, it "should be found that a considerable proportion of the cadmium "has been volatilized, the alloy should be remelted a third time "with an excess of cadmium, so as to bring it to the required "per-centage."

[Printed, 4*d*. No Drawings.]

A.D. 1862, May 28.—N° 1607.

JOHNSON, JOHN HENRY.—(*A communication from Charles Felix Sebille.*)—"Improvements in the manufacture of tinned lead "pipes, and in the apparatus employed therein."

"The said invention relates to an improved system or mode of "of tinning or coating the interior and exterior surfaces of lead "pipes made by hydraulic pressure, and consists of a peculiar "mode of applying one or more layers or coatings of tin over the "lead surface of the pipe, so as to obtain coatings of different "thicknesses as desired. This is accomplished by having a "reservoir of molten tin placed above the tinning tool, so as to "supply the tin constantly thereto. The tin is introduced to the "interior of the pipe by an opening in the mandrill, which regu-"lates the diameter of the same, the tin being applied con-"tinuously as fast as the tube is made, either to the interior or "exterior thereof." "By this system tinned tubes may be ob-"tained of any indefinite length, whilst by the ordinary method it "is necessary to cut the pipe in order to introduce a fresh supply "of tin when the first is expended. The thickness of the tinning "for pipes of all diameters depends, as herein-before stated, on "the number of coats or layers of tin which are applied one over "the other, and consequently facility is afforded for applying a "covering or lining of tin of any thickness desired."

[Printed, 4d. No Drawings.]

A.D. 1862, June 17. N° 1787.

HUNT, JOHN.—"An improvement or improvements in bronzing "or colouring articles of copper, or alloys of copper."

This invention consists in treating the said articles with a solution of bichloride of platinum.

Two solutions are prepared; one, a weak solution for use at a boiling heat, the other, a stronger solution for use at a lower heat. The articles are immersed in a hot solution of cream of tartar, then washed in two or three waters, and transferred to the boiling solution of bichloride of platinum. As soon as a marked change of colour is observed, the articles are removed from the hot into the cooler and stronger solution of bichloride of platinum, and are kept there until the desired colour is obtained; they are then washed and dried. The duration of immersion determines the tint given to the articles. When parts only of the articles are to be coloured, they are gilt or lacquered all over, and the gilding or lacquering is removed by burnishing or otherwise from those parts to be bronzed or coloured. The articles are then treated in the manner herein-before described. "This treat-" ment is particularly applicable to ornamental articles, in which " the ornament is in relief, all parts of the ornament being in the " same plane; or to articles in which the ornament is sunk, the " ground or unornamented part being in relief, and in the same " plane."

Although the above-described method is preferred, one solution may be employed instead of two, and a cold solution may be employed instead of a hot one. The strength of the solution may be varied.

[Printed, 4*d*. No Drawings.]

A.D. 1862, June 28.—Nº 1896.

BESLAY, CHARLES.—" Improvements in galvanizing or coating " metals by electro-chemical agency, and in apparatus connected " therewith."

" My invention relates to improvements on a former Patent " granted to me, and dated January 12th, 1859, No. 103, for " coating or covering metals by electro-chemical agency, and " consists in the galvanization of metals, more especially cast or " other iron and steel by indirect means at the ordinary tempera-" ture with non-concentrated solutions, which I term galvanization " in a cold state."

The inventor first electro-coats the iron with tin, and afterwards with the desired metal, tin forming the intermediate metal as possessing powers of affinity in relation to the iron and the outer metal superior to any other intermediate metal; thus the exterior metal—lead, zinc, copper, or other—coats the iron indirectly and by means of the affinity of the tin.

The battery consists of a " single element " composed of a leaden vessel, the bottom of which is provided with a thin sheet of copper; a zinc plate is laid horizontally on to the copper plate, wooden rods being placed between. " There is no diaphragm, " and one pile of this arrangement equals 12 to 15 elements of " Daniels."

In the depositing baths the inventor's object is not to form " *either stannates,* zincates, or plombates," but to produce sub-salts, "whether of an alkaline or acidulated nature, which are "easier to maintain in a soluble state in slightly concentrated "solutions."

[Printed, 4*d*. No Drawings.]

A.D. 1862, August 1.—Nº 2183.

NURSE, Robert, and **NURSE**, David, the younger.—"An "improved annealing pot."

This invention relates to "the manufacture of annealing pots "intended to be used for annealing plates or sheets of iron to be "afterwards coated or covered with tin, or an alloy of tin and "lead, and termed by tin plate manufacturers 'tin plate.'"

This invention consists in making "the annealing pot" of wrought iron instead of cast iron, "and also in making the pot "double, that is to say, as two cases, one fitting into the other. "By these means the metal will expand and contract without "sustaining injury, and the air will be effectually excluded from "the plates therein."

The Specification describes, and the drawings show, a case of wrought iron formed in one sheet, and rivetted at the bottom to the end or bottom piece. Another case of less thickness fits loosely into the above-mentioned case, and is seamed instead of rivetted. "The aforesaid wrought-iron cases may be made of the "commonest puddled iron." The end of the exterior case, "when worn, may easily be replaced by another piece of sheet "iron." "We would remark that the outside case" "could be "used singly or without the inner case," "or the inner case could "be of wrought iron, and the outer case of cast iron, but we "prefer using the two cases as a double case, wholly of wrought "iron."

[Printed, 10*d*. Drawing.]

A.D. 1862, August 30.—Nº 2410. (* *)

JOHNSON, John Henry.—(*A communication from Charles François Leopold Oudry.*)—"Improvements in coating or covering "metallic surfaces with copper."

"This invention relates to the coating or covering of wrought "or cast iron, zinc, or other metallic surfaces with copper by "means of the magneto-electric or electro-galvanic processes "and consists in the employment of certain peculiar composi-"*tions*," *or other* compositions of an analogous nature, which

" are applied by means of a brush or other suitable method to " the metallic surfaces to be coated with copper before placing " them in the cupreous bath for the purpose of forming an intermediate coating between the copper to be deposited and the " metallic surface to be covered or coated, thereby avoiding the " deleterious action which arises frequently when the copper " is in immediate contact with the metal upon which it is " deposited."

The first of the above-mentioned compositions contains copal, resin, minium, walnut oil, and "benzole or naphtha;" the second contains copal, resin, "silica, or other suitable silicates," "boiled " linseed oil," minium, and "benzole or naphtha;" the third contains copal, resin, "caoutchouc in solution," boiled linseed oil, "coal tar naphtha," benzole, and minium; the fourth contains copal, resin, sulphur, walnut oil, benzole or coal tar naphtha, and minium.

After applying any one of the above compositions to the surface of the metal to be coated, the said surface "is covered with " powdered graphite" before being immersed in the cupreous bath.

To repair any defects in the coating, a "solder" may be used which contains "galvanic copper," wax, copal, and resin.

[Printed, 4*d*. No Drawings.]

A.D. 1862, September 11.—N° 2510.

WHYTOCK, Andrew.—" Improvements in the construction of " coated and uncoated sheet-iron boxes, and in the mode of and " apparatus for straightening coated and uncoated sheet iron."

In order to straighten the sheets that are required for the said boxes, or for other uses, they are passed between rollers "so set " with respect to each other, that they will by friction of contact " with the passing plate or sheet, cause it to move in a serpentine " or wavy line," the deflections of which decrease "as the sheet " nears the last rollers of the series. If thought desirable fixed " bars may be used in combination with the rollers for guiding " the sheet from one pair of rollers to another."

"When the black or uncoated sheet has been thus treated " the scale on its surfaces will be either disturbed or removed, " and thus the action of the 'pickle,' to which the sheet is to " be subsequently submitted, will be rendered more rapid and " *efficient than heretofore.*"

This invention also consists in partially or wholly lining the said boxes with wood, slabs of papier mâché, or other suitable material. This lining "gives facilities to the attachment of the " rim to the top of the box, and the body to the bottom of " the box," as nails or screws are thereby enabled to be used; preferably, cone headed nails or screws are employed.

To make a neat finish to the corners of the lid, malleable cast-iron corner pieces are adapted thereto, and are secured in their places by nails driven into the wooden lining.

[Printed, 10*d*. Drawing.]

A.D. 1862, October 3.—N° 2675.

DALRYMPLE, ALEXANDER.—(*Provisional protection only.*)— " Improvements in the processes of depositing metals by galvanic " action either with or without the aid of galvanic batteries, and " in the ornamentation of metal surfaces thereby."

1st. "Certain improvements in the processes employed in " depositing metals," "by depositing upon only certain portions " of such metal surfaces one or more different metals in such a " manner that these different metals are either inlaid in the metal " surfaces or in relief upon the same."—The design or ornament is transferred, painted, or printed on the metallic surface in a non-conducting composition, the portion so printed upon representing the part of the said surface which is not to receive a metallic coating. The metal article is then electro-etched so as to form a "bed" of the required depth; "the article is then " removed from the cell" and placed in a suitable depositing bath, thus filling up the pattern to the level (or above the level) of the metallic surface. Electro-plated articles may thus be ornamented, and two or more different metals may be used for ornamentation. The design may be stencilled on to the metal surface with wax, and the wax removed after the rest of the plate has been covered with a non-conducting varnish.

2nd. "Forming moulds or dies in iron by galvanic deposition." —A metallized pattern of the mould is placed in an electro-depositing bath that contains sulphate of iron solution; one half of the pattern is operated upon at a time, the other half being temporarily non-metallic. The die thus formed "may be case-" hardened, and afterwards brazed on to a solid piece of metal."

[Printed, 4*d*. No Drawings.]

A.D. 1862, October 18.—N° 2813.

LAUTH, Bernard.—" Improvements in machinery or apparatus for polishing sheet iron or other metal."

Three or more rolls are mounted in a suitable frame and placed one above the other, their axles being horizontal and parallel to each other. Three rolls only are preferred, " the upper and lower " rolls being of equal diameters, and the other or intermediate " roll, which works in contact with the other two, being of a " smaller diameter. The sheet iron or other metal to be polished " is to be passed (either one or more sheets at a time) between " these rolls, and their operation will polish the sheets and give " them a beautiful lustre." By this arrangement "a sufficient " pressure can be obtained to lengthen or draw the thinnest sheet " iron or other metal, which has been hitherto unattainable by " the application of rolls arranged in any other way."

"The smaller or middle roll acts upon the other rolls like a " hammer with a small surface acts upon an anvil with a larger " surface. It draws the iron or other metal with less pressure " more than a hammer with a large surface would draw the same. " By rolling and polishing sheet iron intended for tin plates " in this machine, a great saving in the amount of tin will be " effected, and a great improvement in the appearance of the " plate when tinned will be produced."

The drawings show the said apparatus, in which the rolls are forced into closer contact, and their pressure increased by advancing a wedge in connection with the sliding bearing of the upper roll, a screw being employed to advance the wedge. " The rolls " are driven in the ordinary manner and are geared together by " means of spur wheels as usual."

[Printed, 8*d*. Drawing.]

A.D. 1862, December 3.—N° 3243.

CLAUS, Charles Frederick.—" Improvements in carboy " hampers, and in the machinery or other means used for manufacturing the same."

1st. " Substituting hampers made of wire, or even hoop iron, " covered or coated with tar, varnish, lead, or alloys of lead for " those now in use made of willow twigs, cane, &c."

2nd. " The means and machinery used for manufacturing the " *same, which consists* in weaving the wire or hoop iron round a

" metal or wooden mandrel representing the shape of the hampers. " The said mandrel being furnished with an axle through the " centre parallel to the wires forming the uprights or vertical ribs " of the hampers, a rotary motion is given to it by means of a " crank or rack and lever or similar means."

3rd. " Coating the carboy hampers with lead, or an alloy of tin " and lead, or similar alloys, in order to cause them to resist " better the action of acids and other chemicals, and to make " them firmer. I effect this purpose by following a similar course " to that employed in galvanizing iron, with the addition only " that in order to coat them with lead I pass the hampers first " through an alloy of lead and tin, and then into two or three " consecutive baths of lead only."

[Printed, 8*d.* Drawing.]

A.D. 1862, December 8.—N° 3288.

SANDERSON, Charles.—" An improved mode of manufac- " turing bands for driving machinery, lifting weights and other " analogous purposes."

This invention " consists in making these articles of thin sheet " steel or other metal cut to the width of the intended driving or " lifting band, and coated or protected in a peculiar manner by " india-rubber so as to preserve the metal from oxydation."

" In carrying out my invention the sheet steel or other metal " cut to the proper width and length, is first well cleaned on " both sides by acids or otherwise, in order to remove any oxide " therefrom. It is then coated by the electro-plating process with " brass, after which the metal band is covered with and entirely " enclosed with a sheet of india-rubber which is vulcanized " thereon, when it will be found that the rubber will have such " an affinity for the brass covering that it will adhere firmly " thereto, and cannot easily be detached. Bands of great strength, " such as are required for lifting heavy weights in coal mines, " may be made by combining together two, three, or more thin " bands or strips of steel or other metal, coated and covered in " the manner above set forth, interposing between all the metal " surfaces a layer of vulcanized india-rubber. The india-rubber " covering will not only protect the metal from oxydation, but " will materially assist in causing the band to hold tight on the " driving or lifting pullies."

[Printed, 6*d.* Drawing.]

A.D. 1862, December 30.—N° 3475.

BOWSER, WILLIAM, and BOWSER, HOWARD.—"Improve-" ments in coating or protecting iron or steel with another " metal."

This invention relates more particularly to coating iron or steel with copper, or alloys of copper.

A reverberatory furnace for heating the iron or steel has a chamber in close communication therewith, to which "the iron or " steel is transferred to have the coating metal applied to it." The articles may be moved gradually "through the furnace and " coating chamber at a rate which can be adjusted to suit the " heating powers of the furnace and the size of the articles under " treatment, and so that whilst some articles are undergoing the " latter part of their treatment, fresh articles may be entering " and passing through the furnace." The cleansed article is heated to a welding heat, and "is transferred to the coating " chamber, wherein there is brought into contact with it the " coating metal in the form of sheets, strips, or grains, propor-" tioned to suit the thickness of coating to be applied in one " operation."

An arrangement for coating plates is described and shown, in which the floor of the reverberatory furnace and of the coating chamber is continuous, and the whole is protected from currents of air by means of entrance and exit doors and "valves." The sheets are entered, moved along, and brought out by means of suitably-placed rollers, and a sheet of copper (entering the coating chamber vertically) is kept in close contact, in an angular position, with the heated iron plate.

In coating some irregularly-shaped articles, the coating metal is heated in a separate furnace, and applied to the heated iron "in " a coating chamber in communication with the furnace in which " the iron or steel is heated."

[Printed, 8*d*. Drawing.]

1863.

A.D. 1863, January 14.—N° 123.

MOREWOOD, Edmund.—" Improvements in the manufacture " of coated metallic sheets and pieces, and in apparatus to be " used therein."

The objects of this invention are, in manufacturing tin or terne plates, " to lessen the surface coating of melted metal," and " to " avoid as far as possible the running of the fluid metal to the " lower edge of the sheet or plate."

1st. Making use of more than a pair of rollers or of three rollers working in contact with the flux.—The sheets are conveyed in a horizontal direction in the bath, and the end of the sheet which enters first leaves first. Instead of the three rollers a pair of rollers and guide may be used.

2nd. Causing the sheets " to travel between rollers working in " contact with flux contained in two baths or vessels mechanically " combined."—A travelling or revolving rack is employed, in connection with withdrawing rollers. The rack holds several plates at one time, and, when any one plate has remained long enough in the rack, it is raised to within reach of the withdrawing rollers by means of a hooked rod worked by a cam driving shaft, or other suitable driving arrangement.

3rd. Causing sheets to make their exit from the second bath of molten tin, &c., between rollers working in contact with a flux of fatty matter.—The rollers in each bath are mechanically connected. On the entrance side of the bath the flux used contains chloride of zinc, or chloride of tin, or chloride of cadmium.

4th. Arranging the screws and bearings of the withdrawing rollers in connection with a spring or lever, so as to suit sheets of various gauges. When the heat is not too great, leather may be wrapped round " the outside delivering rollers."

The Specifications referred to in describing this invention are:—Nos. 2235 (A.D. 1859), 2985 (A.D. 1860), and 815 (A.D. 1862).

[Printed, 10*d*. Drawing.]

A.D. 1863, January 19.—N° 163.

HARRISON, William Henry.—(*Provisional protection only.*) —" *Improvements in covering wire and other iron articles for the*

" purpose of protecting them from oxidation, and in the mode or " method employed therein."

This invention " consists in immersing the object to be pro- " tected, first, in a bath of metallic alloy in which lead is present, " but of which tin or zinc forms a large proportion, then after the " object has been so coated treating it mechanically, by drawing, " rolling, or burnishing, and afterwards immersing the object so " coated and treated in a second bath of suitable alloy, composed " entirely or nearly entirely of lead tempered or regulated in its " degree of metallic hardness by the addition of bismuth or other " suitable metal, when the article may again be submitted to " mechanical treatment as before. The two operations of coating, " and the mechanical treatment may be a continuous process, as " the one bath may be in advance of the other, and the cone, die, " or other mechanical apparatus may be interposed between the " two baths. For coating plates or sheets and other similar " articles, rollers will have to be substituted for the cone-hole " draw plate. In every case the first bath must contain a suffi- " cient proportion of lead to ensure an affinity between the " surface of the first coating and the metallic contents of the " second bath."

[Printed 4*d*. No Drawings.]

A.D. 1863, January 20.—N° 171.

BONNEVILLE, Henri Adrien. — (*A communication from Claude Joseph Thirault.*)—" Improvements in coloring, bronzing, " and preserving iron and steel.

" This invention consists in the following operations :—

" First, to form an adherent coat of peroxyde of iron on the " surface of the iron or steel.

" Second, to transform, under the influence of water at a tem- " perature of from 90° to 100°," the said peroxide into magnetic oxide.

" Third, to repeat the operation until this black coating becomes " sufficiently thick and adherent.

" Fourth, to immerse the articles to be coloured in a bath of " lukewarm water," to remove any adhering salts, " and then to " cover these surfaces with a slight coating of olive oil."

The solutions used are :—No. 1, containing mercuric chloride and ammonic chloride. No. 2, containing ferric chloride, cupric *sulphate, hydric nitrate,* and alcohol. No. 3, containing ferric chloride, *ferrous* chloride, hydric nitrate, and alcohol. No. 4, containing "sulphurate of potass."

Two coats of No. 1 upon the cleaned article serves to give the first crust of peroxide. Nos. 2 and 3 are then applied, and the article is immersed in hot water and wiped. No. 3 is again used, and then No. 4; the article is again immersed in hot water and wiped. A weak solution of No. 3 and wiping with a rag impregnated with olive oil finishes the process. During these operations, the gold or other ornaments may be protected with varnish; if they (the ornaments) cannot be protected with varnish, a modification of the process is used in which No. 1 is suppressed.

"Ornamentations in metal deposed by the electric battery should " only be made after the total coloration of the articles," the parts which are not to be so ornamented being protected by varnish which is subsequently removed.

[Printed, 4*d*. No Drawings.]

A.D. 1863, January 21.—Nº 180.

BUNCH, FREDERIC AUGUSTUS. (*Provisional protection only.*) —" Improvements in the manufacture of metallic vessels or " receptacles for containing liquids or substances."

" This invention consists in a new method of manufacturing " metallic vessels or receptacles of whatever form suitable for " containing various liquids and substances, and especially " adapted for use by chemists and druggists. I propose to form " the vessels, whether in the form of bottles, jars, or otherwise, " of a base metal, such as iron, and to immerse them in a bath " or solution of a noble metal, such as platinum, silver, or gold, " bringing the poles of a galvanic battery to bear upon the " articles and upon plates of the desired noble metal, whereby the " plates will become dissolved, and the metal deposited on the " interior and exterior surface of the base metal, thus producing " a surface capable of withstanding oxydation and the effects of " acid, salts, or solutions. In some cases I propose to line or " coat the vessels with a noble metal in the form of foil or thin " sheets, whereby a similar advantage will result."

" By this invention, not only may metallic vessels be used by " chemists and others in lieu of glass, but carboys may be made " of metal capable of withstanding the effects of sulphuric and

" nitric acids without the danger of breakage at present so liable " to occur by the use of glass."

[Printed, 4*d.* No Drawings.]

A.D. 1863, February 13.—N° 388.

JONES, JABEZ.—" Improvements in the manufacture of lead, " tin, and other metals, or amalgamation of metals of a like " fusible nature into sheets of any required thickness and length, " and also coating one or both sides of pipes and sheets of lead " and other metal, or amalgamation of metals with tin or other " substances, and in the apparatus connected therewith."

This invention relates to certain improvements upon No. 3229 (A.D. 1861), also to coating sheets of metal on one or both sides " with tin or other suitable substance" as they are being formed.

1st. Certain arrangements of the piston and containing vessel described in the above-mentioned Specification, also of the dies " so that the sheets may be delivered in a downward direction."

2nd. " Passing the sheets as formed through a bath of molten " tin, tar, or other suitable material in such a way that they may " be coated therewith on one or both sides when so required."—Guide rollers in the interior of the baths, and others external thereto, enable the sheets to properly traverse the molten metal and deliver them in a finished state.

3rd. Forcing out the molten metal to be formed into sheets through cylindrical dies, receiving it on a mandril, cutting it open, and flattening it out. " When the sheets are to be coated " on both sides, it is preferred to cut and open out the pipe or " cylinder before passing it through the bath of the material it is " required to cover them with."

[Printed, 8*d.* Drawing.]

A.D. 1863, February 25.—N° 534.

TOMKINS, GEORGE.—" Improvements in the manufacture of " tin and terne plates, and in the apparatus to be employed " therein."

By means of this invention the plates are made with great rapidity and of good quality.

To make " tin plates" the iron plates are dipped into the pot, and, instead of afterwards leaving them in the grease pot, they *are then drawn upwards* through metal clams. The clams are arranged in a frame placed horizontally on the top of the metal pot, "a lifting rack at the bottom of the pot will raise the plates, "after which they are to be caught with clips and removed."

For lead and terne plates the clams are used, but in lieu of dipping the iron plates into the molten metal, a tray with a gutter is formed above the clams. "The iron plates are held in a rack "below the tray and above the pot; they will be raised up through "the clams by means of clips after the molten metal has been "poured into the tray above them. From each end of the gutter "a series of tubes, from two to two dozen, communicate, through "which the metal runs, and passes out through narrow slots cut "along the sides of the pipes or tubes, by which means the metal "runs down the sides of the iron plates and coats them."

After being coated with sal-ammoniac, the plates may be dipped into the molten metal by means of a sliding rack. Instead of the sliding rack a circular or revolving rack, "half of which rotates "in the molten metal," may be used.

Great advantage is stated to result from the employment of an alloy composed of nickel, zinc, and lead.

[Printed, 8*d*. Drawing.]

A.D. 1863, March 19.—Nº 738.

SAUNDERS, JOHN, and PIPER, JOSEPH.—"Improvements "in apparatus employed in the manufacture of tin and terne "plates."

This invention applies to the equalization and removal of the excess of coating, by passing the plates through heated grease.

A pair of rollers revolves in the grease trough, and each roller is pressed towards the other by means of springs. An overflow pipe, with an adjustable delivery end, retains the grease at the desired height. The necks of the rollers, &c., revolve in a separate grease trough, from which also there is an overflow pipe. "Below the trough in which the rollers revolve and in connec-"tion therewith there is a descending trunk, the lower end of "which descends to the bottom of another trough, into which "the tin or terne metal removed from the plates descends, and "from it such metal is removed." The coated plates are placed in succession into a portion of the upper trough, and each plate, as it is introduced, descends into the trunk till its lower edge rests on a lifting bar or cradle therein. The plate is caused to assume a vertical position in the cradle by the action of certain fingers. "The lifting bar or cradle is then raised by a lever " handle which brings the upper edge of the plate to the nip of " the rollers, so that by the revolution of the rollers the plate is " raised out of the grease, which is kept heated by any suitable " means."

The method which is preferred to keep the grease and molten metal heated, consists of a fire-place from which two flues proceed. These flues are provided with dampers to regulate the temperature of the various parts of the apparatus.

[Printed, 2*s.* 6*d.* Drawings.]

A.D. 1863, March 27.—N° 802.

MORGAN, WILLIAM MILLINGTON.—" Improvements in coat- " ing metals, and in machinery and apparatus employed in " coating metals."

This invention relates to the coating of metal sheets or plates with tin or lead or alloys of tin and lead.

1st. "The use of fluxes consisting of chloride of zinc, or chlo- " ride of zinc and chloride of potassium."—The said fluxes are confined in a flux box at the side of the bath of melted metal " at which the plates or sheets are made to enter," and are put " on the surface of the melted metal slowly in a state of " solution."

2nd. Conducting the plates through the bath and smoothing their surfaces.—The lower half of a drum, which turns on a horizontal axis, dips into the melted metal. " Near opposite edges " of the bath, and on opposite sides of the drum, are two hori- " zontal shafts parallel with the drum shaft." An endless chain passes over pulleys on the said shafts, underneath the drum, bearing against the under side of the drum. By the rotation of the pulley shafts the plates are introduced into the bath and delivered therefrom, the said plates being " inserted between the " chains and the drum." " On emerging from the bath the " coated plates rise through tallow, grease, or other fatty matter " or flux on the melted metal and pass between two polished cast " steel, iron, copper, or other hard surfaces situated nearly in " contact, the space between them constituting a slit through " which the plates pass, and by the sides of which the surfaces " of the plates are smoothed. The superfluous metal is thereby " removed and a smooth surface given to the coated plates."

[Printed, 6d. Drawing.]

A.D. 1863, April 1.—N° 841.

MITCHELL, WILLIAM.—(*A communication from James Mitchell.*) —"An improved process for coating iron."

The metal of which the articles are to be formed should be of the best kind, carefully rolled and freed from scale. The articles are immersed in dilute sulphuric acid, scoured, washed, and "deposited in a vat" containing potash; this concludes the cleansing process.

In the bath of molten meltal or alloy the salts of sulphur or arsenic are used "in a modified form, so as to produce a slight "negative action without injuring in any degree the tenacity of "the alloy." The surface of the bath is protected with a slag "formed of sand and clay." "When about to use the bath, the "slag is to be pushed back," "and the space filled with borax," which acts as a flux.

Prior to immersion in the bath of molten metal, the cleaned plates are placed in a bath containing dilute sulphuric acid and oxide of copper or sulphate of copper, "until their surface exhibits a precipitated metallic surface of copper;" this covering "acts as a flux on the iron." The articles are then immersed in "a saturated solution of alum."

A plate, prepared as described above, is plunged into the bath more than half its length; when sufficiently coated, it is withdrawn, so as to make the metal spread evenly, laid on a turntable and then the other end of the plate is dipped, taking care that the coating shall join in the centre.

The furnace for holding the bath of molten metal "is similar "in form to a common puddling furnace."

[Printed, 4*d*. No Drawings.]

A.D. 1863, April 8.—N° 891.

KINDER, ARTHUR.—"Improvements in coating or covering "lead or alloys of lead with tin or alloys of tin, and in the "apparatus employed therein."

This invention relates to the formation of solid ingots, coated as set forth above, which are "to be subsequently reduced to the "desired thickness by the ordinary processes of rolling or beating, "or of rolling and beating."

1st. A plate, cast in the usual way, is removed from its mould and placed in a second mould which has contractible or adjustable sides; the requisite thickness of tin is then cast upon the lead.

2nd. Prepared sheets of tin are placed upon the surface of the lead whilst the latter is in a heated state. "A roller is passed by "hand over the tin to bring it into close contact with the lead."

3rd. The sides of the mould in which the lead is first cast slightly project above the surface of the thickest plate required. An adjustable lid projects slightly into the interior of the mould, "the amount of entrance therein coinciding with the thickness of "tin or alloy of tin to be united with the lead or alloy of lead." The lead having been cast in this mould, the cover is removed, and the melted tin is poured on to the surface of the lead, and then smoothed off on the surface with a roller.

"When it is desired to cover both sides of the alloy of lead, a "a mould or frame is employed provided with a movable and "adjustable cover both on the top and bottom sides, and the lead "is run in between these covers." The cover being removed, the tin is applied to one surface, the mould is then reversed, the other cover removed, and the tin applied to the other side of the lead.

[Printed, 1*s*. 4*d*. Drawings.]

A.D. 1863, April 17.—N° 963.

KNIGHT, Richard.—"Improvements in treating and prepar-"ing iron, copper, and other wires for telegraphic and other uses, "for the purpose of preserving them from corrosion or decay."

The wire is first "pickled," then scoured with silver sand and "conducted through a vessel containing spirits of salts or other "suitable material, and from thence, whilst wet, into a bath of "pure melted tin, and as the wire emerges from the bath, the ex-"cess of metal adhering thereto is removed by suitable wipers or "other instruments."

"The wire thus coated is, by preference, conducted through or "between two pairs of adjustable grooved or other form of metal "rollers, one pair being placed horizontally and the other pair "vertically, or they may be placed diagonally or in other suitable "positions, so as to be at right angles or nearly so to one another, "by which the coating of tin is compressed upon the surface of "the wire in two or more different directions." The compression of the coating, produced as above-described, completely closes up the pores of the tin, so "as to prevent the coated wire from being "*chemically acted* upon by acid or other solutions, or from the

" oxygen of the atmosphere, or from other atmospheric, gaseous,
" aqueous, or submarine influences."

[Printed, 4d. Drawing.]

A.D. 1863, April 24.—Nº 1025.

SHAW, WILLIAM ANTHONY.—" A mode of lining lead pipes " with tin or its alloys."

This invention " consists in introducing a hollow ingot of tin " or its alloys within a hollow ingot of lead, and forcing the two " metals, while over a core, out of a cylinder through a die by " hydraulic or other suitable pressure.

" To effect this object the ingots may be separately cast and in" troduced within the cylinder, or the lead ingot may first be cast " in the cylinder around a core of the size of the tin ingot, and " then that core be removed and the tin ingot cast into that space " around a core of the size of the pipe when made. The lead " pipe by this plan is formed with a perfect lining of tin or its " alloys, for the two metals are simultaneously forced out of the " cylinder through the die, and form a perfect tin pipe within the " lead pipe, the two being firmly united together, and the tin " lining can be made of any desired thickness according to the " relative size of the ingots."

" It will be evident that the tin might be cast separately, and " intoduced within the lead ingot. I prefer to work off only " about two-thirds of the contents of the cylinder before adding " a new charge."

" In case the tin ingot, in consequence of being harder than " the lead, should draw through faster than the lead, it may be " made rather longer, and the end pass up into a recess around " the base of the core."

[Printed, 8d. Drawing.]

A.D. 1863, April 27.—Nº 1048.

ROBERT, JEAN JOSEPH.—" Improvements in the manufacture " of spoons and forks."

This invention " applies to the manufacture of plated spoons " and forks and consists in covering with an extra coating of " silver those parts most exposed to wear. The plan of silver " tipping the ends of forks has been employed for some time, but " in spite of this in a comparatively short time both spoons and

" forks become unusable from the silver wearing off those parts " on which they rest when on the table." This invention " entirely obviates this, and the spoon or fork treated in the " manner herein-after described preserves its beauty, and lasts " at least twenty times as long as those coated in the ordinary " manner.

"The modus operandi is as follows:—When the spoon or fork " comes from the stamping press, the parts on which it rests are " ascertained, and on these a small plate of silver is soldered, the " size and weight of which varies of course according to the sized " spoon, and the durability which it is intended it shall have. " The plates are made to adhere to the spoons and forks by means " of silver soldering, incrusting them on as it were by subjecting " them to heat almost sufficient to melt the metal. The spoon or " fork is then subjected to the acids usually employed in this " manufacture, after which it is again passed under the stamping " press, where it undergoes a pressure of from thirty to forty " thousand kilogrammes; the spoon or fork is then plated in the " usual manner."

[Printed, 6*d*. Drawing.]

A.D. 1863, May 8.—N° 1156.

CLARK, WILLIAM.—(*A communication from George Washington Holley.*)—" Improvements in coating wrought or other iron to " protect it from corrosion or oxydation."

" This invention consists in a process for securing upon the " surface of iron a coating consisting in part or wholly of metallic " aluminium."

A frit is made that contains feldspar, silex, china clay, white lead, and a certain proportion "of any of the fat alum or potash " clays so called;" the whole is reduced by water to a proper degree of consistency, and the cleansed iron is dipped into the compound, or the mixture may be poured on to the iron. The compound is then drained off, so as "to leave only a thin covering " on the iron," and the said covering thoroughly dried. The iron, being placed in a reverberatory furnace so as to glaze the coating, will be found to be covered with a vitreous coating, which has a coating of metallic aluminum between itself and the iron, firmly adhering to both.

Another frit, employed as above, contains feldspar, silex, china clay, "sal soda," "Spanish white," and boracic acid. These materials are mixed, melted, and drawn off into clean water.

"To coat iron with aluminium alone," boracic acid is added to " any of the fat alum or potash clays," calcined and pulverized; these are mixed in water. The iron is dipped into the paste thus formed, and dried, baked, and allowed to shrink by cooling; as the iron shrinks the slag will throw itself off. The surface thus obtained may be treated with common coal oil or kerosene. Sulphate of baryta may be added to the clay and boracic acid, and, when the iron is heated to redness, it may be dipped in the fluid mixture, and allowed to cool off slowly.

[Printed, 4*d*. No Drawings.]

A.D. 1863, June 11.—N° 1453.

DEANE, Edward.—(*Provisional protection only.*)—" Improve-" ments in cooking and culinary utensils."

"This invention consists in making cooking and culinary " utensils, such as boiling pots, saucepans, gravy pans, preserving " pans, and others of steel coated with tin.

" I first prepare the steel by the decarbonization process, and " then I prefer to give to it by blocking or otherwise the shape " and configuration of the utensil or vessel required, after which " I immerse it in a bath of tin as adopted by tinners, and having " passed the article through this process, it is, when dry, fit to " be used for the purposes required."

[Printed, 4*d*. No Drawings.]

A.D. 1863, June 19.—N° 1541.

NEWTON, William Edward. — (*A communication from Augustin Henri Hamon.*)—(*Provisional protection only.*)—" Im-" provements in the manufacture of leaden pipes."

This invention " consists in lining the pipes with tin or other " suitable metal or alloy which is not liable to be affected by any " liquids that may be conveyed through the pipe, and which is " not, therefore, likely to be injurious to health. In carrying out " the invention the leaden pipe is heated, and a metal core is " inserted therein in such a manner as to leave an annular space " all round between the core and the leaden tube. This space is " filled up with molten tin, which firmly adheres to the lead.

" The pipe may then be drawn down in the ordinary way, and a " leaden pipe with a tin lining will be produced."

[Printed, 4*d.* No Drawings.]

A.D. 1863, June 23.—N° 1580.

PARSONS, Thomas Fulham.—" Certain improvements in the " mode or modes of preparing plates, bars, or other objects of " iron for being coated with metals or alloys."

These improvements, " although relating chiefly to the preparation of plates and other objects to be coated with tin and its " alloys, are likewise applicable where copper, zinc, lead, or their " alloys are intended to be used, and the said improvements " consist in immersing the plates or other objects to be coated " in a weak solution of sulphuric acid simply for the purpose of " loosening the oxyde, cinders, and other impurities, and in subsequently completely removing them and thoroughly cleaning " the plates or other objects by scraping or grinding the same. " The scraping may be effected by means of tools or instruments " of steel furnished with sharp edges; and for the purpose of " grinding the plates I propose to use either horizontal or vertical grindstones, or discs, or plates made of copper, lead, or " other metal, or other suitable material acting through the " instrumentality of sand, emery, or other equivalent substances, " the plates or other objects being fixed in convenient frames or " holders."

" A to-and-fro or reciprocating movement may be imparted to " these revolving grindstones or discs, whilst the plate under " operation remains stationary, or such motion may be imparted " to the plate, the scraping or grinding instrument remaining " stationary. Such parts of the plates, bars, or other objects as " may not be accessible to the revolving discs may be scraped by " hand or by steel scrapers."

[Printed, 4*d.* No Drawings.]

A.D. 1863, July 1.—N° 1639.

JOHNSON, John Henry.—(*A communication from Xavier Florentin Girard.*)—" Improvements in coating or covering metal " sheets with metals or alloys, and in the apparatus employed " therein."

"*Applying a coating* of tin, zinc, lead, or other metal or alloy, " *in a state of fusion,* to sheets of iron or copper."

Near one end of the vessel containing the molten metal a pair of metal rollers rotates in suitable bearings, the lower roll being revolved by the action of the upper roll. "The level of the molten " metal in the vessel should coincide with the point of contact " between the rollers." A guiding plate serves to direct the plates to be coated to the rollers. Chloride of zinc floats upon the surface of the tin in the fore part of the vessel, "and to prevent oxydation resin or fatty matter is floated upon the tin in the after " part of the vessel. As the plate passes through the rollers, " which are rotated either by power or by manual labor, it takes " up a thin film of the tin or other metal or alloy in the melting " vessel, and this film is evenly spread over its entire surface by " the pressure of the rollers."

When large sheets are to be coated, a narrow deep melting vessel is used; the bottom of the plate rests upon a stirrup, which elevates the plate and guides its upper end between the rollers.

"In order that the tinned or coated plate may be readily cooled " on leaving the rolls it is proposed to attach to the supports of " the apparatus a tube having a long slit therein and communicating with a fan or blower."

[Printed, 10*d*. Drawing.]

A.D. 1863, August 7.—N° 1958.

MOREWOOD, Edmund.—"Improvements in coating metals."

In coating sheets or pieces of iron or other metal with "melted " coating metal," the flux used consists of "either rosin, sal-" ammoniac, chloride of zinc, or chloride of tin mixed with carbonate of soda and other suitable metallic salts in a fluid " state," either in the preparatory flux bath mentioned in No. 123 (A.D. 1863), or on the surface of the melted coating metal at the entrance side of the bath. The flux is employed in connection with a rack, which enables the pieces of metal to be withdrawn from the bath free from the flux through which they passed on entering the bath.

Elastic finishing rollers, surfaces, or forms are mounted at the exit part of the bath.

An arrangement for giving an up-and-down movement to plates, or for transferring them from one bath to another, consists of a spring clip mounted on an axis, which is capable of rising and *falling in a groove*.

Heating the finishing rollers by independent means, so as to work the bath of metal at a low heat.

The rollers are supplied with fresh coating metal, by means of a vessel containing the coating metal, and heated by a hot-air tube.

The iron sheets pass between pairs of heated rollers immediately after entering the coating bath.

The space intervening between two baths is roofed in. The covers have funnels, dampers, and doors.

The plates are submitted to the action of cleaning acid or its vapour, by means of a travelling rack containing the said plates.

Nos. 846 and 2235 (A.D. 1859) are referred to.

[Printed, 1*s.* 6*d.* Drawings.]

A.D. 1863, August 22.—N° 2088.

MOORE, Siegmund.—" Improvements in the means of and " apparatus for electro-plating, said apparatus being also appli- " cable to medical purposes."

" I interpose between the battery and the bath containing the " object to be coated and the metallic solution an electro-magnetic " apparatus or instrument which will give out both the direct, and " the to and fro, or intermittent currents as may be desired."

It appears from the drawings that the battery circuit is complete without including either the break or the water regulator. When, however, branches from the battery circuit, that form the primary circuit, are connected, they include the break. The water regulator is included in the secondary circuit. The fine wire of considerable length that forms the secondary circuit, is so connected up that it forms a branch of the primary circuit.

" The primary electric current is applied to the purpose of " electro-deposition ;" in this case the break is in that part of the circuit that leads to the depositing bath. " The metallic solution " should not be the ordinary cyanide solution, as used at present, " but I reserve to myself the use of specially prepared solutions " applicable to my invention." The deposit takes place rapidly, and its character is " superior to that acquired by the ordinary " slow deposit, and as smooth as glass."

A water regulator is described in detail.

The secondary circuit is used for medical purposes.

[Printed, 6d. Drawing.]

A.D. 1863, August 29.—Nº 2182.

PUTNAM, Henry William.—"An improved machine for " wringing clothes."

This machine consists of india-rubber rollers in combination with certain ratchets, cams, pawls, and coiled springs.

The rollers employed in this machine are constructed as follows:—Their shafts "have their journals turned, and that part to be " covered with the rubber rolls or tubing is encased in a metallic " mould, which fits accurately around the journals," "to prevent " the escape of the molten metal, leaving a space on all sides " of the shaft. Then a liquid alloy of tin and zinc, or lead and " antimony, or any other alloy, or a simple metal, as tin, lead, or " zinc that will melt at from 300° to 600° Fahrenheit is poured " into the mould, and in this manner the iron shaft is completely " encased." "The mold is so formed as to allow the ends of " the alloy" "to expand into flanges," "forming the collar " against which the ends of the rubber roll rests." "The rubber " tubing or roll is drawn over the flange" "by means of a cone," " temporarily introduced upon the shaft. The elastic roll re- " tracting as soon as it passes over the flange, the metallic " covering," "by being coated with dissolved india rubber, " causes the rubber roll to adhere permanently in place upon " the shaft. The vulcanized rubber contains sulphur, which " corrodes the iron shaft when the two are in contact in the " presence of moisture, which soon loosens the rubber from the " shaft; but with the described improvement this corroding will " not take place, for the rubber is not in contact with the iron " shaft, but with a metal that is not readily acted upon by the " sulphur."

[Printed, 4d. Drawing.]

A.D. 1863, September 24.—Nº 2356. (* *)

WEBSTER, James.—"Improvements in utilizing the waste " flux from galvanizing works."

These are, treating the waste flux as follows:—In the galvanizing of iron "a considerable quantity of muriate of ammonia " or sal ammoniac is used as a flux," and "in a short time " a dirty mass is produced, consisting mainly of chloride of " zinc, oxide and carbonate of zinc, a little metallic zinc, and " occasionally a trace of muriate of ammonia." Hitherto this has been of little use. "The object of the present invention

" is to utilize this material, and to this end" any quantity of the spent flux is macerated in either hot or cold water for from 5 to 10 hours, and when most of the chloride of zinc has been dissolved out, the solution is stirred, which causes the oxide or carbonate of zinc to be held in suspension; the solution is drawn off into "a second tank standing at a lower level, and " if necessary, repeat the process of maceration in the first tank, " until the greater part of the chloride of zinc has been dissolved " and run into the second tank." The oxide or carbonate of zinc is allowed to settle down, and the liquid is run into a third tank, washing the oxide or carbonate of zinc remaining behind. " The liquid in the third tank" is now treated "with ammoniacal liquor, such as the refuse liquor from gas works, which " causes a precipitate of oxide of zinc, and leaves a solution of " muriate of ammonia. This solution when evaporated and " crystallized in the ordinary way may be used in galvanized " works or disposed of elsewhere." The precipitate undissolved in the first tank would find a ready market among refiners. "The " precipitates in the second and third tanks are, when properly " dealt with, very suitable for conversion into paint."

[Printed, 4*d*. No Drawings.]

A.D. 1863, October 30.—N° 2690.

RUSS, BARNABAS.—" Improvements in the construction of iron " and other ships, vessels, and batteries of war and of cupolas, " and armour plates applicable thereto, parts of which improve" ments are also applicable to other useful purposes."

The metal employed for the armour plates, in this invention, is coated with other metals.

The armour plates may have "a back and face of iron, with an " interior of steel." To accomplish this, the three parts are manufactured separately and superposed, then subjected to a welding heat. ".To assist the union of the plates" a flux may be used.

"To effect a tight and compact fitting or bedding of the plates " when screwed up," "lead packing may be applied." The melted pig lead is run on to a level surface of iron "with a frame around " it."

Copper or an alloy of copper is caused "to run into a fluid or " molten state by aid of borax or other suitable flux;" the cleansed *plate is then dipped* into the molten metal."

In order to coat the armour plates with tin they are cleansed and heated; the molten tin is then poured on the surface of the plate. Copper or composition plates that are applied to the armour plates may be similarly coated.

Certain modes of preventing "corrosion or electrical action" are set forth. For this purpose a composition containing plumbago, oxide of lead, turpentine, and varnish, is used.

[Printed, 1*s*. 10*d*. No Drawings.]

1864.

A.D. 1864, February 6.—N° 320.

SINIBALDI, Marie Celeste de Casteras.—"Improve-
" ments in the manufacture of plates, tubes, cylinders, and other
" articles, and for covering or coating the same with copper,
" brass, or other metals."

"In constructing a laminated or compound plate of a number " of layers of iron or steel," "I place between them thin sheets " of copper, brass, or other metals, and after securing them " closely together I immerse them in the melted metal."

"Another method is to coat each separate sheet of iron" with a thin coating of the metal in which it is to be immersed, or of an easily fused metal.

In making iron tubes, coated sheet iron, fixed on a mandril, may be immersed in a bath of molten copper.

Another method is to coil up a thin sheet of copper with a sheet of iron and fuse them together. A wickerwork or coat of mail of iron or steel may be immersed in molten brass. A long plate may consist of iron and copper brazed together alternately. Cylinders may be covered with copper by fixing a covering or lining thereto of copper sheets and uniting the whole by heat.

"Another method is to place the object to be coated in a box " or mould leaving a space therein to form the thickness of the " coating, and after making the mould to the required heat to " cause to flow through it a stream of molten metal, which is " continued till it is found that the two metals are united."

A design may be stamped on a steel plate and so placed in a mould that the molten metal shall fill up the design.

[Printed, 2s. 4d. Drawings.]

A.D. 1864, February 10.—N° 351.

SINIBALDI, Marie Celeste de Casteras.—"Improve-" ments in coating with copper, brass, or other metals the" surfaces of ships and other structures of iron or steel."

"The ship or other structure to be covered is placed on a" 'gridiron' or other position where it can be kept perfectly dry." The surface to be coated is then cleaned free from scale or other" impurities, and the copper, brass, or other covering metal is" applied and held to the surface to be coated, and by the appli-" cation of heat is fused thereon."

"For applying the coating to ships or other structures under" ordinary circumstances, I employ a portable furnace provided" with suitable apparatus to be easily and quickly moved from" one part to another of the surface of the ship or other structure" being coated, by means of which I melt the copper or brass" which is applied by pouring to the surface to be coated, which" is previously made hot."

In some cases the molten metal is applied by means of ladles," as used in the ordinary work of a foundry."

The cleaned surface of a plate of copper may be applied to the cleaned surface of the object to be coated. The sheet of copper is secured in the required position by means of an iron framing covered with fire-clay, and a sufficient heat is applied at the back of the plate.

A sheet of metal may be superposed upon a thin coating.

[Printed, 2*s*. 10*d*. Drawings.]

A.D. 1864, February 29.—N° 497.

WEIL, Frederic.—"Improvements in coating metals with one" or several other metals, and in oxydizing the surface of these" latter."

By the use of this invention the coating adheres perfectly to the article and may either have a brilliant or a dead appearance.

The solutions herein set forth may either be employed as dipping solutions, in conjunction with the galvanic action of zinc immersed in contact with the article, or in connection with a separate galvanic battery. The said solutions contain "simul-" taneously with a large excess of a fixed caustic alkali, a salt" *of the metal, which* is to form the coat," and "tartaric acid

" glycerine, or any other suitable matter preventing the precipi-
" tation of the oxide of the said metal."

The coppering solution may be made by adding a solution of sulphate of copper to a solution containing tartrate of potash and soda together with caustic soda. For colouring coppered articles the solution contains a larger quantity of the salt of copper than for merely coating with copper.

Iron and steel are bronzed by immersion in the solution, in contact with zinc; brass is bronzed or coloured by mere immersion in the cupreous solution.

A silvering solution for previously coppered articles, is formed by an aqueous solution of nitrate of silver, tartaric acid, ammonia, and cyanide of potassium.

Zinc may be deposited on copper by means of a concentrated hot alkaline solution which contains an alkaline cyanide. The salt of iron used, in connection with tartaric acid and caustic alkali, for depositing iron, is the perchloride of iron.

[Printed, *6d.* No Drawings.]

A.D. 1864, April 9.—N° 898.

RICHARD, Benoit Xavier, and RADISSON, Raymond.—" Improvements in the manufacture of gold and silver wire."

" For this purpose we cast silver or gold into an ingot, which " we pierce through the centre of its length with a hole, into " which we run rose or refined copper or other suitable metal. " Afterwards, when the solidification is complete, this compound " ingot is rolled or drawn down until it is reduced to the dimen- " sions required for the wire to be produced, the wire being sub- " jected to the annealing and other operations of wire drawing. " The copper in the interior of the ingot is drawn down, together " with the exterior metal, the two metals forming but one and " the same body. The interior metal may be introduced into the " ingot, in any other suitable manner, as for example, by electro- " type processes, or by introducing mechanically, or by the aid " of solder, a metallic core into the ingot, or by casting silver or " gold around an interior core. We do not limit ourselves to the " use of copper for forming the core of the ingot, as other metals " may be employed for this purpose."

It is preferred to cast the ingot square in cross section. The central and longitudinal hole is then drilled or formed in the mould, and its interior is cleansed with an alkaline solution. The ingot is heated to 550° or 650° Fahrenheit to receive the molten copper; it is then hammered into a cylindrical form, and drawn through a draw plate in the ordinary manner.

[Printed, 4*d*. No Drawings.]

A.D. 1864, June 21.—N° 1538. (* *)

PUGHSLEY, William John.—" Improvements in obtaining " sulphuric acid from the refuse 'pickle' used in tin plate works, " and also from sulphate of iron or 'green copperas.'"

The used or refuse pickle is evaporated and crystallized, the mother liquor drawn off from the crystals is evaporated a second time and crystallized, and the mother liquor is drawn from the crystals and again concentrated "to a sufficient strength to be used as " 'pickle' for cleaning the iron plates for the process of tinning." " For extracting the sulphur from the crystals," above which are " sulphate of iron or 'green copperas' and converting the same " into sulphuric acid or oil of vitriol," the copperas is distilled in a retort, "the sulphur escapes into a leaden chamber or con- " denser in communication with the retort where it condenses," and " proceed to convert the same into sulphuric acid or oil of " vitriol in the usual manner. The refuse left in the retort is " pure oxide of iron."

[Printed, 4*d*. No drawings.]

A.D. 1864, August 6.—N° 1956.

LEYSHON, George.—" Improvements in the manufacture of " tin and terne plates, and in machinery or apparatus to be used " in the said manufacture."

This invention is to avoid the bulging of the plates during their manufacture, to produce plates of better quality than usual, " and " to economize the grease and metal used in their manufacture."

The invention consists of:—

1st. " Introducing the plates to be tinned or coated in a vertical " position into a frame or cage situated in the first grease pan, " and removing the said cage and plates from the said grease pan " into and out of the tinning pot and into the washman's pot by " mechanical means, instead of by hand." A frame or cover is jointed to a connecting rod; when the cage is to be risen it is *fastened to the* cover, and a cranked axle with spur wheel gear, being worked by a winch, places the cage as desired, according to the degree of rotation of the winch; half a revolution of the crank moves the cage from the tinning pot to the washman's pot.

2nd. "Removing and collecting the superfluous tin or terne
" metal from the lower halves of the plates, and also the tin or
" terne metal which usually accumulates on the bottom edges of
" the plates and forms a ridge there, by supporting the said plates
" after their removal from the second grease pot in a rack on an
" iron plate floating or fixed on a bath of melted tin or terne
" metal."

3rd. Economizing the grease, by passing the said plates between a pair of rolls, and thereby removing and collecting the grease from them. When the rolls rotate, a nearly vertical support under the said rolls, and which is geared to one of them, lifts the plate until it is grasped by the rolls.

[Printed, 1s. 2d. Drawings.]

A.D. 1864, August 9.—N° 1981.

CLARK, William.—(*A communication from Frédéric Kuhlmann.*)
—" Improvements in the means of producing ornamentation on
" porcelain, glass, metal, and other surfaces."

1st. The production of ornamental designs by applying solutions of crystallizable matters "on suitable polished surfaces."

2nd. Fixing the said designs by means of varnish, collodion, or vitrification.

3rd. Chemically transforming the said crystalline designs by means of various reactions.

4th. Reproducing the said designs by the aid of photography,
" galvanoplasty," or pressure. Copper stereotype plates may be
" produced by simple pressure between rollers, or in hydraulic
" presses by the compression of sheets of iron, steel, or German
" silver, having the crystalline designs applied thereon against
" sheets of annealed copper, which latter will serve for printing."

5th. Fixing and producing the above-described designs by the above-mentioned processes, " the operation being effected at very
" low temperatures."

6th. Fixing the said designs by means of coloured varnish.

7th. The reproduction of crystalline designs on metals and on glass by the action of solvents. Glasses so engraved may be silvered; silver film may be gilded by means of a bath of cyanide

of potassium containing chloride of gold, the precipitation of the metal on the metal " being facilitated by the simultaneous contact " of a zinc plate with a film of silver and gold bath, or it may be " produced by the aid of a galvanic pile."

8th. An improved method of engraving on glass.

[Printed, 4d. No Drawings.]

A.D. 1864, August 15.—N° 2029.

MOORE, SIEGMUND.—" Improvements in electro-gilding."

By means of these improvements " a more rapid, durable, and " richly colored deposit of gold is obtained than by the ordinary " means."

The solution contains " prussiate of potash," " pearl potash, " iodide of potash," " carbonate of soda," " cyanide of copper," " cyanide of silver," " fine gold," and water.

" I apply a battery of which the conductor is a zinc plate with " a copper wire attached thereto, the other end being connected " to the article to be gilt in the bath, the zinc plate being suspended in the solution; this form of battery will be found " sufficiently strong to cause the decomposition and deposition " of the gold upon the article, and the results first stated will " thereby be accomplished; but, if thought more convenient, an " independent or separate battery may be employed."

[Printed, 4d. No Drawings.]

A.D. 1864, September 1.—N° 2150.

FOWLER, THADDEUS.—" An improved method of coating pins " and other articles with tin or other metals."

This invention consists of a method " of separating pins and " other articles so soon as thoroughly covered with the coating " metal by the use of a series of riddles, wires, or rods, to which " a vibration or motion is communicated to produce a series of " blows or concussions upon the articles as they fall from the " successive riddles, wires, or rods, and thereby ensure the entire " separation of the articles while the coating metal is in a melted " state."

After being dipped into " muriate of zinc," the pins are introduced into a kettle, together with a suitable quantity of tin. The kettle is then " placed in a furnace at an inclination and " agitated while the pins are becoming heated and the tin melted." *The said kettle* may either be agitated by hand (a handle being provided for the purpose), or a crank movement, or other suitable mechanism may be employed to shake and partially rotate the kettle. When the pins are thoroughly coated, the contents of the kettle are emptied directly upon a vibrating screen, beneath which are other vibrating screens, "and these all stand over a " vessel of water so that the pins as they fall through these " screens are so much agitated that they are knocked apart and " effectually separated from each other before they reach the " water."

By this process the coating " will not be rough or frosted in " appearance, as would be the case if the pins were in contact " with each other while agitated and cooled."

[Printed, 8*d*. Drawing.]

A.D. 1864, December 14.—N° 3095.

THOMPSON, Jacob Baynes.—" Improvements in coating " iron and steel with silver, gold, platinum, or palladium, and in " ornamenting articles with such metals."

To prevent the electro-deposit from peeling off in burnishing, the surface of the iron or steel is first alloyed with "an alloy of " tin with other metal (such as copper and nickel)," by immersion in the molten alloy; this alloy has "a suitable melting point " for wiping and tempering." When coated and tempered, or cooled, the article is washed with caustic potash, pickled in dilute hydrochloric acid, and washed in clean water. The electro-deposit is then made upon the prepared article in the ordinary way.

Another part of this invention consists in "ornamenting sur- " faces of silver by the application of gold, or gold and platinum " thereto by means of an artists brush or pencil of hair or fibre " containing a solution of the metal to be applied and coupled " up with a battery." This pencil has a hole down the centre of the handle for the battery wire to pass. A strand of fine platinum or gold wires is spread out in the brush part of the pencil, and connected above, through the handle, to the positive battery pole, " while the article to be ornamented is connected to " negative pole In such ornamentation the gold will serve as " the body of the design, and the platinum for shading or bring- " ing up the design in relief. This metal painting can be gone " over as often as required to bring it to the desired thickness in " the different parts of the design."

[Printed, 4*d*. No Drawings.]

A.D. 1864, December 24.—N° 3207.

MOREWOOD, EDMUND.—" Improvements in coating metals."

These improvements relate to coating metals by immersion in molten metal.

1st. Making one or both of the sides of the " flux box " movable, or capable of turning on a hinge. When a sheet of metal reaches the lower edge or edges of the sides it causes one or both to open, but they close again as soon as it has passed.

2nd. To prevent the rollers from collecting dirt, they have hollows or grooves arranged opposite to one another. By a combination of guides and rollers that do not touch one another, the sheets have an " in-and-out travel under the coating metal."

3rd. Placing finishing rollers so that there shall be a channel of melted coating metal above the nip of the said rollers. An oblong box (open at the top and bottom, but narrow towards the bottom) may be placed in the said channel; a similar box is placed for the travel of the sheet below the finishing rollers, so that the sheet may pass entirely through pure metal.

4th. The diameter of the finishing rollers is five inches or more. This enables the depth of the channel to be regulated, gives a steady motion to the plates, and throws more heat upon them as they emerge into the open air. A scraper keeps the said finishing rollers clean.

5th. " Using tooth wheels and friction wheels combined," to give a steady motion to the rollers of the coating machine.

6th. " Using a copper bath and copper rollers " for the liquid or flux, through which the sheets or pieces pass before they enter the coating metal.

7th. The use of an earthenware pan containing a bad conductor of heat, placed upon or immersed in the coating metal, so that the sheets pass under the said pan; the heat of the melted metal is thereby retained, and evaporation from its surface is lessened.

[Printed, 10*d*. Drawing.]

1865.

A.D. 1865, February 18.—N° 469.

GRAHAM, JAMES. — " Improvements in treating products " *obtained when* coating iron with zinc."

1st. Treating "chloride of flux skimmings or dross removed "from the surface of melted zinc."—The crushed dross is acted upon by water and steam in an open vessel of wood, having a false bottom of wickerwork. Oxide of zinc is precipitated from the solution thus obtained, by adding soda ash thereto, in a vat that is furnished with a cover to prevent the escape of ammoniacal fumes; through the centre of the cover a shaft, with stirring arms, passes into the vat, and mixes the alkali with the liquid; enough alkali is used to set free all the ammonia contained in the liquid. The liquid is then drawn off into a still, and the chloride of ammonium (resulting from the distillation into a receiver containing weak hydrochloric acid) is crystallized out. When only liquid ammonia is desired, lime is the precipitant.

2nd. Treating "spelter dross," the material which subsides to the bottom of the bath.—The said dross is broken into pieces "and then the spelter is distilled off in a spelter furnace, using "pots or muffles similar in form to what are known as Silesian "muffles used in the reduction of zinc ores into spelter," and "made with bottoms highest at the back and inclining towards "the front;" "so that the spelter dross when melted may not run "out of the muffle." At the closed end of the muffle a receiver is luted on, in the centre portion of which is a hollow in which the distilled spelter accumulates.

[Printed, 4d. No Drawings.]

A.D. 1865, April 18.—Nº 1081.

JENKINS, John Jones.—"Improvements in the manufacture "of tin and terne plates."

The object of this invention is to economise the amount of coating metal employed.

A pair of vertical rollers are applied in the trough containing the grease and tin or terne metal. A pair of horizontal rollers are arranged above the said vertical rollers and extend to the end of the trough; they are connected by spur wheel gearing, and with the driving roller of the vertical rollers by bevil gearing. "The other portion of the trough is provided with a grate, the "level of which corresponds with the lowest part of the rollers, "and the plate to be treated is to be let down thereon and inserted "laterally between the nip of the vertical rollers, which then "immediately draw it underneath the horizontal rollers and over "a lifting grate, the attachments to which are brought upwards

" and between the sides of the trough and the rollers; then by " means of a crank handle the grate is slightly elevated, and the " plate is in turn inserted into the nip or bite of the horizontal " rollers, and is thus lifted out of the trough."

The drawings show a system of levers, actuated by a handle, which drive the plate from the lowering grate into the nip of the vertical rollers. The grate that receives the plate from the vertical rolls and elevates it to the nip of the horizontal rolls is capable of a to-and-fro movement by means of a slotted hand lever, which also elevates and depresses the grate by its junction with a connecting rod.

[Printed, *6d.* Drawing.]

A.D. 1865, July 12.—N° 1843.

SAUNDERS, John, and PIPER, Joseph.—" Improvements " in apparatus employed in the manufacture of tin and terne " plates."

This invention consists in improvements in the apparatus described in No. 738 (A.D. 1863). In this apparatus the plates are caused to pass through heated grease to equalize and to remove the excess of the coating.

Instead of casting the upper trough, lower trough, and trunk in one piece, as heretofore, these parts are cast separately, and are bolted together by means of flanges and screw bolts.

" The shafts or axles of the rollers which work in the upper " trough do not pass through the end of such trough, as was " formerly the case, but they are geared together at one end " within the trough by cog wheels or pinions, and one of such " cog wheels or pinions receives motion from a cog wheel on a " driving shaft which is above the end of the upper trough. The " small grease trough, formerly used at the end of the upper " trough where the roller shafts or axes passed out of the end of " the trough, is dispensed with, and also the tube which descends " therefrom.

" The lifting apparatus is as heretofore. One of the rollers is " pressed towards the other by two levers, the upper ends of " which are acted on by springs and screw nuts."

Chains, passing over curved arms to a roller, regulate the distance that the plate rack descends into the trunk, " according to " the length of plate which is being worked."

[Printed, 10d. Drawing.]

A.D. 1865, September 22.—N° 2416.

BOGGETT, William.—(*Provisional protection only.*) — "Improvements in manufacturing wire conductors for electro-telegraphic purposes."

It being taken for granted that "the currents of electricity usually employed in electro-telegraphy" do not penetrate the substance of the wire, but pass along it in contact with the surface only, the inventor uses an iron or steel wire, covered with copper, instead of a conductor wholly composed of copper. The iron or steel gives increased tensile strength, and, "in cases where either of those metals are suspended in the air," the copper protects them from oxidation.

"I pass copper wire between rollers in order to flatten it the requisite size and thickness; it is then annealed and one end enfolded longitudinally over the wire to be covered; in this state they are inserted in a hole of proper dimensions in a draw-plate, when the copper wire by the act of drawing through will encase the iron core in a uniformly smooth and closely adhering cover.

"According to my view the power of conduction depends wholly on the amount of surface. It may in some cases be desirable to increase the surface of the wire by fluting it after the manner of pinion wire, and if desired it can be amalgamated with quicksilver."

[Printed, 4*d.* No Drawings.]

A.D. 1865, October 2.—N° 2521.

ALLAN, Thomas.—(*Provisional protection not allowed.*)—"Improvements in the preparation of iron, steel, and alloyed metals for electro-plating."

"My Invention consists in preparing the surfaces of the metal to be plated so as to receive and take on the silver or other metal without the intervention of a third metal to produce a base or surface suitable for plating. After 'pickling,' that is, exposing the articles to an acid solution for cleaning their surfaces, as is well known, I place them in an alkaline or in an acid bath, and subject them to galvanic or electric currents. On being removed from the bath they will be in a fit state to receive the plating by the well-known process for the electro-deposition of metals."

[Printed, 4d. No Drawings.]

A.D. 1865, October 3.—N° 2530.

BONNEVILLE, Henri Adrien. — (*A communication from Claude Ernest Lami de Nozan.*)—(*Provisional protection only.*)— " Improvements in the construction of submarine telegraph " cables."

"This invention relates to an improved construction of sub" marine telegraph cables with a view to their better preservation " and protection from injury. It consists, firstly, in covering or " surrounding the conducting wire or wires with a tube or " envelope of tin or other suitable and analogous metal before " placing the hemp, tow, or other outside covering and the iron " or steel shielding which protects the whole; and, secondly, in " interposing between the gutta percha which surrounds the " conducting wire or wires and the metal tube, a twisted or " plaited layer of asbestos intended for protecting the insulating " matter in case of it being necessary to solder the metal tube " or envelope."

[Printed, 4*d*. No Drawings.]

A.D. 1865, October 7.—N° 2592.

THOMPSON, Jacob Baynes.—" Improvements in coating " iron and steel with gold, silver, platinum, or copper."

These improvements involve the electro-deposition of iron.

This invention " consists in first depositing iron from a solu" tion on to the surfaces of articles composed of iron or steel, " and thus obtaining thereon a coating of pure iron, and then " further coating the surfaces of the articles with gold or silver, " platinum, or copper by deposition from a solution of one or " other of these metals."

The solution which is preferred for the electro-deposition of iron upon the pickled article, contains ferro-cyanide of potassium and potash, and during deposition is kept at a temperature of from 100 to 120 degrees Fahrenheit. "The intensity of the " battery should be such that when at work a few bubbles of " gas only are given off." Having been electro-coated with iron, the article is washed with a solution of ferro-cyanide of potassium, and is at once transferred to the bath for the deposition of the exterior metal.

" For silver and gold the ordinary cyanide baths may be em" *ployed,*" " *and* for platinum an alkaline sodio-chloride solution" *is used.*

"For the deposition of copper on the iron-coated article I use "the ordinary cyanide solution, or a solution of hydrated oxide "of copper in hyposulphite of soda." The solution is worked at a temperature of about 60° Fahrenheit. To hasten the deposit the article may be transferred to a sulphate of copper bath after it has received a thin deposit as above.

Plated or gilt articles that are subjected to much friction are heated to a heat that will char wood; "this as it were burns the "silver or gold into the steel or iron."

[Printed, 4*d*. No Drawings.]

A.D. 1865, October 21.—N° 2733.

PARKES, ALEXANDER.—"Improvements in electric telegraph "conductors."

Tubular conductors of copper are strengthened "by internal "cores of steel or iron or aluminium bronze, such interior "strengthening cores being drawn or extended with the copper "conductor." When iron cores are used, their ends are connected together by welding, and when aluminum bronze cores are employed, their ends are hard-soldered together; a split tube of copper, or a flat tape of copper, is then applied over each joint and fastened by soldering with silver solder. "These conductors "are then coated with any of the ordinary insulating substances, "but the compound called 'parkesine' is preferred, and when "using this description of compound it is found that the pro"portions should consist of about 100 parts by weight of dis"solved cotton, 100 to 150 parts oil (preferring castor oil), and 50 "parts of camphor."

In practice, an annealed and clean iron or steel rod is introduced into a seamless copper tube that will just receive it freely. By means of rolling and drawing processes combined, a wire of the desired size is made from the compound rod, the material being carefully annealed after each operation. It is preferred, as far as possible, to make the joints "before the con"ductor has been reduced to a small diameter, and as soon "as the copper tube has thoroughly closed on the inner rod," and the drawing down operations are continued after making the joints.

[Printed, 4*d*. No Drawings.]

A.D. 1865, November 3.—N° 2842.

NORTHWOOD, Edward John.—(*Provisional protection only.*) —"Improvements in plating or combining gold, platinum, and " other metals or their alloys."

1st. "The use of a malleable alloy or solder for the fixing of " one metal or alloy upon another by the medium of a third in " a process of fusion."

2nd. The disposition of various metals or alloys; one on one side, a second in the middle, and a third upon the other side, for instance.

3rd. The use of gold, silver, platinum, palladium, and copper " in any process," "and also the use of alloys of the above metals " with tin, zinc, nickel, or aluminium."

4th. Treating poor alloys by an acid process, and applying a coating of gold upon the surface; also, closing the skin of gold alloy upon the surface by the application of a solution of chloride of gold. The gilding is pressed and the solution is applied before the said pressure is used.

5th. "The formation of leaf from alloys produced by this " process."

A sheet of the plating alloy and an ingot of the alloy to be plated are fastened together with a thin sheet of solder (silver and copper) between them. A thin sheet of copper, fitting round the edge of the solder, prevents its overflow when the whole arrangement is heated in a muffle. For wire the process is similar, and the compound metallic masses thus produced may be rolled or drawn.

When the proportion of gold in the alloy is small, the ingot is boiled in weak nitric acid, washed, and dried. The sheets are placed in an ethereal solution of gold, if a very thick coating is required, and the whole is passed several times through the rolls or drawplate.

[Printed, 4*d*. No Drawings.]

A.D. 1865, November 16.—N° 2948.

DE LA HAYE, John.—"Improvements in the construction of " and in the method of laying submarine electric cables."

The first part only of this invention relates to the present series of *Abridgments*. It consists "in covering copper wire conductors

" with a thin coating of gold in order to protect or preserve them " and at the same time to give them increased strength. The " gold after being made into thin leaves can be laid on mecha- " nically by light pressure by gilding in the usual way, or it can " be united by the process well known as electro-plaiting, or by " other convenient means."

[Printed, 10*d*. Drawing.]

A.D. 1865, December 9.—N° 3180.

BOGGETT, WILLIAM.—(*Provisional protection only.*)—" Im- " provements in the construction of wire conductors for electro- " telegraphic purposes."

1st. A central round copper wire is covered longitudinally by a flattened wire or fillet, one end of the said fillet being enfolded " lengthways round one end of the wire conductor;" this combination is then drawn through a suitable drawplate, and a uniformly smooth and closely adhering cover to the central wire is thus formed. " When the end of the first length of inner wire " is reached," it is connected " with another length, either by a " long scarf or dovetail joint," and the outer covering is continued over it; " when the end of the flat wire is reached a second length " is added bringing the two into contact."

2nd. A number of small copper wires are enclosed " within a " flatted wire or fillet as previously described." The said small copper wires are hexagonal in transverse section.

3rd. A round copper wire is surrounded " by a circle of small " wires of square or other approximate section;" the whole is enclosed " in a longitudinal cover or fillet in the manner herein- " before described."

4th. Into each of the grooves formed in a round copper wire which has been corrugated lengthwise (" in the shape of pinion " wire ") a small wire of suitable size is laid; the whole is then enclosed " in an outer covering, as previously described. In each " case the outer covering or fillet may be amalgamated with " quicksilver in order to diminish induction."

Other metals besides copper, also alloys, may be used for the outer covering or fillet.

[Printed, 4*d*. No Drawings.]

A.D. 1865, December 9.—N° 3183.

MOREWOOD, EDMUND.—" Improvements in coating metals, " and in apparatus to be used for this purpose."

A rack, containing the sheet to be coated, moves at the extremity of a long lever, through a considerable arc of a circle, so that time is afforded, from the instant at which the plate enters the molten metal to that at which it departs from it, for the coating metal to unite with its surface, and for all traces of flux to be removed prior to its being passed through the exit rolls, the axes of the said exit rolls being parallel to the plane in which the sheet travels.

The levers carrying the plates are actuated by eccentrics and eccentric rods, and have also a vibratory motion communicated to them by means of corrugations on the outer surfaces of arcs that are oscillated by the said eccentrics.

The bath containing the racks and rollers " may be filled with " flux suitable for finishing coated plates in place of the coating " metal."

One roller of each pair may be heated by hot air, and the rollers may be mounted as set forth in No. 123 (A.D. 1863).

The plate as it comes from the coating metal, is passed perpendicularly into the grease of the finishing pot through rollers which take the excess of metal from it; the plate is then raised up through rollers to improve its surface.

One part of the bottom of the grease pot is made lower than the other parts to receive the coating metal that drops from the rollers; the excess of metal is removed by means of a tube and plunger.

A worm and worm wheel impart motion to the rollers, this prevents "jogging," and enables the whole of the gearing to be placed below the surface of the metal.

[Printed, 1*s.* 4*d.* Drawings.]

A.D. 1865, December 21.—N° 3299.

BOGGETT, WILLIAM.—" Improvements in the construction of " wire conductors for electro-telegraphic purposes."

According to this invention, several small copper wires are used to make one conductor, but they are so perfectly in contact throughout their length that the increase of inductive action that would otherwise take place is avoided.

1st. Two half round copper wires are taken, "one of them " having on its inner or flat side a recess slightly undercut, and " the other a corresponding projection." "When the two are " placed together and passed through a drawplate, they become " equal to a solid wire for the intended purpose." As the joints of each half round wire are wide apart, neither break of continuity occurs nor soldering of joints is required. It is preferred to construct these compound wires "by combining and dovetailing " three segments or lengths of wire together."

2nd. A flat copper ribbon is used to cover "one or more other " wires." The end of the ribbon is enfolded "lengthways" round the wires or wires to be covered, and the compound wire thus formed is drawn through a drawplate. In one instance round wire forms the centre, and is enfolded as above set forth; "scarfe" joints connect the round wire, and the ribbon is continued over it and joined by contact. In a second instance, a number of small wires (of hexagonal cross section) are enclosed within the said ribbon. In a third instance, a round wire is surrounded by a circle of small square wires, and the whole is enclosed in the said ribbon. In a fourth instance, wire in the shape of pinion wire has small wires laid in its recesses, and the whole is enclosed in the said outer covering.

A screw thread, bound over with copper wire, gives strength to the joints.

[Printed, 8*d*. Drawing.]

A.D. 1865, December 28.—N° 3357.

VARLEY, CROMWELL FLEETWOOD.—" Improvements in the " construction of telegraphic cables or conductors."

To prevent a fault in the insulator from causing the solution of the copper conductor by electrolytic action, one or more wires of the strand of the said conductor is or are made entirely or in part of platinum, or the conductor may consist of a copper tube with a platinum core drawn down into wire. One or more of the "spirals," or helically-coiled wires in each joint is made of platinum.

[Printed, 4*d*. No Drawings.]

1866.

A.D. 1866, March 27.—N° 889.

RAWSTHORNE, James, and BAYLEY, Edward Hodson.—" Improvements in carts for distributing water, liquid manure, " and other fluids over roads and land."

1st. " Regulating the amount of flow from the body of the " cart."

2nd. Employing an elastic medium " as a spring between the " base of the body and the other part of the cart."

3rd. " Submitting the body of the cart to the process of galvanization, or covering with zinc by immersion in the molten " metal to prevent oxidation. After having been properly cleansed " by immersion in dilute hydrochloric acid or other suitable " cleansing bath, the body is in the mass immersed in the galvanizing bath; suitable stays are provided to prevent the " warping of the body during its immersion in the molten zinc. " In this connection it may be noted that the shape of the body " of the cart may be made to suit the circumstances of the case; " although we prefer a rectangular cross section, the body of the " cart may be cylindrical or of other suitable shape."

4th. "The use of 'Spence's' ship-lining composition, or other " suitable 'Spence' composition to prevent the oxidation and " corrosion that the body of the cart is subject to internally from " the continual abrasion of impurities against the rivets and " other parts."

[Printed, *4d.* No Drawings.]

A.D. 1866, July 21.—N° 1902.

SAUNDERS, John, and PIPER, Joseph.—" Improvements in " the manufacture of tin and terne plates."

In preparing plates for tinning, they are taken out of the cold-water cistern in which they have been placed after the last or white pickling; and passed singly through between one or two pair of rollers which are covered with vulcanized india-rubber, thus freeing the plates from water. To absolutely dry the plates they are received from the rollers " on to an endless chain or apron, " which is arranged to carry them through a heated chamber."

To neutralize the acid, lime may be used in the cold-water *cistern, or the plates* may be immersed in a solution of sal ammoniac prior to being passed through the rollers and drying chamber.

The above-mentioned drying enables the plates to be introduced into grease raised to a high temperature, and it is a prominent feature of this invention that the first grease pot should be heated by the direct action of a fire to a temperature of from 450° to 560° Fahrenheit. A rack in this grease pot receives the plates, as they require to remain therein for some minutes. "Scruff" metal may be placed at the bottom of this grease pot; the inventors find this advantageous to the success of the subsequent processes.

The plates are then immersed in the melted metal in the tinman's pot, taken out singly and dipped into another pot of the melted metal. They are then passed between pressing rollers that work in grease, and (if necessary) are brushed.

The operation of pickling, cold rolling, and drying, may be repeated "as often as is required."

[Printed, 10*d*. Drawing.]

A.D. 1866, July 25.—N° 1934.

BROOMAN, CLINTON EDGCUMBE.—(*A communication from Mayeul Bernabé.*)—(*Provisional protection only.*)—"A new or " improved process or method of treating armour plates to " render them inoxidizable."

"This process or method is based upon the employment of " electro-metallurgy applied to cover the plates with an insu" lating" [?] "and protective coating of copper, the effect of " which when so produced is by a peculiar action of neutraliza" tion of the electric currents to render the plates quite inoxi" dizable."

"The plates are shaped, perforated, and prepared for putting " together before being submitted to the three following ope" rations:"—

1st. The plates are cleaned by immersion in a suitable acid liquid.

2nd. The cleaned plates are electro-coated with copper by means of "a bath made alkaline by cyanide of potassium." By this means the iron is "insulated" or separated.

3rd. Increasing the thickness of the copper deposited by the alkaline bath, by means of an electro-deposit obtained in "an

" acid bath of sulphate of copper." "The plates should be left " in this bath for from one to two days."

[Printed, 4*d*. No Drawings.]

A.D. 1866, July 25.—N° 1938.

NEWTON, William Edward.—(*A communication from Elliot Savage.*)—" Improvements in treating iron for the purpose of " converting it into steel or hard metal, and for plating or coating " and hardening and tempering iron and steel.

The iron or steel to be treated is immersed in a crucible containing melted cyanide of potassium, and allowed to remain therein until it has acquired the temperature of the bath. While the iron is hot it is removed to a cooling bath consisting of a nearly saturated solution of cyanide of potassium in water. If it be intended to coat the iron with silver, some chloride of silver is added to the aqueous solution; the chlorides of other metals may be used, according to the coating desired to be given. The metal thus treated will be found to possess a hard or steely character, the hardness of the steel depending upon the temperature of the melted cyanide.

In dealing with engraved plates of steel the chloride of silver solution is made by dissolving the chloride "in a solution of " cyanide of potassium in water, or in solution of ammonia." " By increasing the specific gravity of the cooling solution the " temperature at which the steel should be at the moment of " immersion may be lowered, and consequently the risk of change " of shape or of fracture will be lessened accordingly."

[Printed, 4*d*. No Drawings.]

A.D. 1866, August 15.—N° 2095.

WEBSTER, James.—" Improvements in coating and recovering " metals from chlorides and other solutions of metals."

This invention relates to coating copper, brass (or iron coated with copper or brass), with tin and zinc, chloride of zinc—or the refuse flux skimmed off galvanizing pots used in "galvanizing" iron—being, by preference, used for that purpose.

When the refuse flux, in a cast-iron boiler, is raised to a temperature of 600° Fahrenheit, scrap tin, or thin sheet wrought-iron scrap is added thereto. The boiler may have a longitudinal division in the middle, one side being used for dipping the articles to be coated, the other side to receive the scrap, there being free access of the melted chloride to each side.

All articles to be coated are to come into contact with some scrap on the dipping side of the partition or division; the coating is said to be in consequence of the hydrogen gas escaping from the decomposing iron scrap, and will protect the article "from " oxidation."

Acid chloride of zinc aqueous solution, having immersed therein iron in contact with copper, will deposit zinc on the copper, the iron being dissolved in proportion to the zinc deposited.

All articles must be pickled prior to the coating; after coating they are immersed in boiling water.

Copper coated by this process may be melted down, giving brass as a result.

"A battery may be used to increase the depositing zinc, as in " the ordinary way."

[Printed, 4d. No Drawings.]

A.D. 1866, October 30.—Nº 2810.

BOUSFIELD, George Tomlinson.—(*A communication from Charles Henry Perkins.*)—"Improvements in treating sheet-iron " plates for the purpose of preparing the same for being coated " with zinc for producing the so-called 'galvanized iron,' and " also for manufacturing such plates in imitation of Russia " iron."

The portion of the invention that relates to preparing the said plates for being coated with zinc is as follows:—Instead of removing the scale from the iron by mechanical or chemical means, the inventor converts the scale into pure iron by depriving it " of " the elements with which the iron is combined to form the oxide " during the process of its manufacture;" at the same time "the " quality of the metal of the sheet is improved by driving off any " constituent impurities which it may contain." To accomplish this conversion, a number of common sheet iron plates are packed in a moulder's iron flask, turnings or chips of iron being also placed therein, so as to completely cover the pile of plates as well as the surfaces between each pair of plates. The flask is covered and made perfectly air-tight; it is then submitted to a heat little short of fusion for about twelve hours. When the flask has cooled, the plates are removed—they are of a dull silvery hue—

and subjected to pressure between the surfaces of polished rollers. To anneal the sheets, they are again piled in a close flask with iron chips and turnings, exposed to heat for about twelve hours, and allowed to cool gradually. They are then fit to be " galvanized."

" The same principle can be successfully employed in preparing " other articles, as, for example, nails and screws for receiving " a coating of metal to prevent oxidation."

[Printed, 4*d*. No Drawings.]

A.D. 1866, November 20.—Nº 3047.

BROOMAN, Clinton Edgcumbe.—(*A communication from Mayeul Bernabé.*)—" A new or improved process or method of " coating or covering iron and steel with copper or copper alloys."

This process comprises three operations, which are:—

1st. Cleaning or scouring.—The article is immersed in weak sulphuric acid for six hours, rinsed in water, rubbed with sand and water (carbonate of soda is added to the water), and finally " rinsed with fresh water."

2nd. Electro-coating the article with copper or copper alloy by means of an alkaline bath.—The alkaline bath consists of a very strong solution of cyanide of potassium containing carbonate of copper. "The baths of brass and bronze are obtained in the " same manner, substituting for one part of the copper such " proportions of zinc or tin as will give the desired result according to the shade to be obtained." These solutions are worked by means of a Bunsen's battery; Archaud's modification is preferred. A five minutes' coating in this bath is sufficient to preserve the article from oxidation.

3rd. Increasing the first coating of copper or alloy given to the article by the second operation by submitting it to the action of the electric current in a sulphate of copper bath.—The electric current is obtained for this bath by means of amalgamated zinc in porous cells, and the article is immersed therein for forty-eight hours. To keep the solution charged with copper, portions of the liquid are taken out and crystals of the sulphate dissolved therein with heat, the saturated liquid being poured back into the bath; bags of the sulphate are also placed in the bath. When coated, the article "is washed in fresh water."

[Printed, 4d. No Drawings.]

A.D. 1866, November 21.—N° 3060.

MOREWOOD, Edmund.—" Improvements in coating plates or " sheets of metal."

The present practice in coating sheets or plates of iron with tin or terne metal is to pass them into the second pot of melted coating metal immediately after they are withdrawn from the first coating pot, whenever a second pot of coating metal is used. Instead of this, the inventor proceeds as follows :—A bath of grease or flux is interposed between the first and last coating metal pots ; this flux bath is furnished " with a carrying apparatus " or instrument and withdrawing rollers, so that the plates which " have been passed into this flux bath from the first coating metal " are conveyed by the carrying arrangements and rollers through " and out of the grease or flux."

This flux pot and apparatus is also used " to level or smooth " the coating which the plate has received in the first pot before " it is passed into the after coating pot." A partition is used in this second metal pot, so as to divide the surface; a suitable arrangement conveys the plate from one side of the bath to the other. From this latter coating pot the plates are passed on to the finishing grease pot, " which also contains a carrying arrange- " ment and withdrawing rollers."

When heavy plates are to be coated, or when the plates, whether heavy or light, are to have a very fine surface, or to reduce further the coating, the inventor uses two finishing flux or grease pots, with apparatus and rollers, instead of one; the plates are passed directly from one to the other, thus a superior appearance is obtained.

[Printed, 4*d*. No Drawings.]

A.D. 1866, November 27.—N° 3118.

CROCKFORD, Charles.—(*Provisional protection only.*)—" Im- " provements in obtaining useful products from certain materials " produced in the process of galvanising or coating iron with " zinc."

1st. Treating " bath or flux skinnings."—A solution is made by boiling and grinding in water. By treatment with lime, oxide of zinc and chloride of ammonium is obtained. Carbonate or sulphide of zinc is precipitated by carbonate or sulphide of sodium. *Sulphide of barium* furnishes sulphide of zinc. The proper equivalent of sulphate of ammonium being added and the residue boiled, chloride of ammonium sublimes and zincic sulphate remains. Ammonia may be used to precipitate the oxide of zinc. Treatment with sulphuric acid yields sulphates.

2nd. Refining "dross spelter" collected from the bottom of the galvanizing bath.—A retort, somewhat like a Belgian retort, but oval, is charged partially with ground coke "or some inert " material," the zinc dross is then placed, then some more ground coke. The condensing pipe inclines, so that the condensed zinc runs out into a proper receiver.

3rd. The vapour arising from the galvanizing bath is collected and condensed, by conducting the said vapours into a tower filled with coke, upon and through which water falls in a finely divided state. A hood and a flue or flues conduct the vapours into the tower. The said flue or flues may be connected "with any suitable condenser, and thus condense and collect the vapours."

[Printed, 4*d.* No Drawings.]

APPENDIX.

A.D. 1637, December 7.—N° 112.

JACKSON, Joseph.—This "sp̃iall priviledge" is granted "for " fourteen years, to use and ex̃cise within England and Wales, " 'The sole making, casting, and guilding of all sort of leaden " 'seales, after a way by him invented, nowe used by the newe " 'draꝑs within the same kingdome and đnion.' "

[No Specification enrolled.]

A.D. 1772, April 3.—N° 1010.

HOMER, Mark.—" A grate or stove, with its appurtenances " made of metal, plated with silver, with or without ornaments " of enamel or lapis lazuli."

The following is the description of the invention :—" By plating " *of iron or copper,* or a mixture of copper and brass, with a suffi-

" cient quantity of fine silver, according to the value of the work, " which are united together by a proper degree of heat, after- " wards hammered, rolled, or flatted down to a proper thickness " for use, and worked into form by stamping, chasing, or hammer- " ing, according to the different forms required; the iron work " to be plated, and the ornaments of enamell or lapis lazuli are " made use of discretionally, as the same may be required."

[Printed, 4d. No Drawings.]

A.D. 1777, August 1.—N° 1165.

MARSTON, John, and BELLAMY, Samuel.—" A method of " stamping upon plated metal, gilt, and other metals, all sorts " of hat and cloak pins, and all kinds of figures, decorations, " ornaments, and other devices for cabinet furniture and lock " furniture, and intermixing divers colours in the same."

" Sink, grind, and polish a die," and take a bar of plated, gilt, or ordinary copper, roll it out thin, and cut it into sizes suitable for the design; " when so cut, first neal them, then boil them " in allum and water, and afterwards burnish them." The metal is then stamped with the die, and the hollow is filled up with an alloy of " tin, regulus, and lead." According to another plan, a thin metal plate, of the size of the hollow, may be placed therein, " and the outside metal turned over such plate." In filling up the hollow of the hat and cloak pins, a shank, nail, or screw is thereby soldered therein. When a plate is put into the hollow, the screw is " bored up to the head through the middle of the " plate before such plate is put in the hollow;" the screw may be soldered to the plate with the above composition. After the article is made, it is heated, and coated with a mixture of " gum " sandarak " and spirits of wine, " and those not plated or gilt may be coloured with " a lacker made of spirits of wine, seed lake, " and ornatto."

"To intermix divers colours " a foil of the desired colour or colours is placed under a portion of the article that is stamped completely out for the purpose. Another method consists of laying on paint of the desired colour.

[Printed 4d. No Drawings. See Rolls Chapel Reports, 6th Report, p. 163.]

A.D. 1778, December 23.—N° 1205.

BENT, William.—" A new kind of ship blocks, which turn " *upon iron or steel* pins or axles cased with metal."

"The pins of the blocks are made of iron or steel, which may " be prepared for covering with metal by pickling, tinning, " fluxing, or otherwise, or without such preparations, though the " same thought to be preferable; after which a proper quantity " of metal, consisting of brass, copper, tinn, pewter, lead or other " metal, or a composition of all or any of the said metals, is " melted and poured or cast upon the pins, which are previously " put into a flask or mould, to which pins the said metal adheres, " and thereby the pins become free from the inconvenience of " rusting, which iron pins not covered are very liable to, and " such pins so covered preserve a sufficient strength; and pins " cased or covered as above specifyed may be applied to the " purpose of bolting ships. The shives of the said blocks may " be made of mahogany, lignum vitæ, or other wood, with or " without pieces or plates of metal fixed on each side in the " centers to strengthen the wood; or the whole shive may be " made of metal or of cast iron. If of cast iron the holes in the " middle should be lined with metal, which may be done either " by casting in the same manner as above described for covering " the pins. The block case may be made of elm or any other " wood."

[Printed, 4*d*. No Drawings. See Rolls Chapel Reports, 6th Report, p. 141.]

A.D. 1779, March 22.—N° 1215.

BENNETT, Thomas.—A "compound metal for lining copper, " brass, and iron vessells so as to make them as sweet as if of " solid silver, and more durable than any other invention for that " purpose discovered."

"Melt two pounds of grain tin, then take eight ounces of silver " as thin as can be made, and dip it into sal-armoniac water, and " dry the same, then put the silver into the melted tin, and in a " few minutes the same will incorporate into one body, which " being done will be fit for lining the copper, brass, and iron " vessells, so as to make them as sweet as if of solid silver. To " put the metal on the vessels is as follows: First, clean the " copper and other vessels well, and wash them over with sal-" armoniac water; dry the vessels, and lay the metal on the " same, but with a stronger heat than the common method of " tinning."

[Printed, 4*d*. No Drawings.]

A.D. 1782, January 14.—N° 1316. (* *)

MARTIN, Joshua Lover.—A "new-invented art of drawing "tubes, plated or otherwise covered with silver or gold, on copper "or other metal, for the purpose and construction of telescopes, "perspectives, opera glasses, and various optical, mathematical, "and philosophical instruments, to which they are adapted."

"The copper or metals to be plated is first covered with silver "or gold, and afterwards formed into tubes and soldered. They "are then applied to the draw bench, and being first put on a "triblet or mandril, are drawn through the holes of different "sizes according to the required thickness of the tubes. This "being done, they are made into telescopes, perspectives, opera "glasses, or other optical, mathematical, or philosophical instruments, where plated tubes may be required. And to prevent "the surface of the plated metal tubes, in the necessary action of "sliding, from being scratched or otherwise defaced (which would "be the consequence of tubes sliding in metal), the collars or "springs thro' which the plated tubes are made to slide is lined "with cloth, velvet, or other soft substance."

[Printed, 4*d*. No Drawings.]

A.D. 1787, October 30.—N° 1624.

ALSTON, James.—"A new manner of making buttons of iron "or steel, covered with tin and other metal, or tin alone."

The rolled iron or steel is freed from scale, and the blanks are cut out by means of "a common piercing press;" the shanks are then either soldered or screwed into the said blanks. Those intended to be stamped (when tinned) are put into a suitable vessel, and mixed in layers, with pounded charcoal, bone-dust or saw-dust; they are then annealed by the application of heat and slow cooling, shaken in a box, pickled and scoured. The buttons are kept in lime water until wanted for tinning.

The buttons being dipped into a solution of sal-ammoniac, are drawn whilst wet through pounded rosin, and put into a perforated iron box. The closed box is then immersed in molten tin and moved about until the buttons are completely coated; the superfluous metal is then beaten off. In order that the buttons should at last be tinned with a smooth surface, they are suspended by wire hooks, so that no button shall touch another, and dipped into molten tin, the surface of which is covered with a fat substance. A few smart blows drives the tin away and the buttons are placed in hot water until the tin upon them becomes fixed; they are then shaken in hot bran, and, if necessary, further cleansed, stamped, and polished.

By the foregoing methods cast-iron buttons previously annealed may be tinned.

"For tinning, I make use of grain tin, tin alloyed with bis-" muth, best London pewter," or "other composition of tin" which will melt sufficiently fluid."

[Printed, 4*d.* No Drawings. See Rolls Chapel Reports, 6th Report, p. 178.]

A.D. 1790, January 15.—N° 1722. (* *)

ROBERTS, Samuel, the younger.—"The method of making" candlesticks of white metal plated with silver."

Iron or steel dies are cut "to the form and pattern of each" particular part of the candlestick." White metal, either simple or compound, is plated with silver in a flat piece, "rolled or flatted" to the proposed thickness of the candlestick," and cut into pieces of the size and shape of each die. Each piece is stamped in the die for which it is cut out, unless there are parts "where the" work in the die is too deep for the plated metal to bear stamping" into without injury to the silver;" in such case the silver must be stamped in the die, "moulded in sand, and the white metal" melted and cast or poured upon it." If the metal plated upon be iron or steel, "it will be necessary to stamp the plated metal" when red hot." The superfluous edges are cut off, each piece is levelled on the edge with a file, the different parts are bound together with wire, and each joining is soldered with silver or tin solder. The candlestick is then "cleaned off, which may be done" by boiling it, if plated on iron or steel, in spirits of vitriol and" water; if on any of the other white metals, in pearl ashes and" water." Each joining "must be repaired with a file or bur-" nisher," and the candlestick is then ready to receive the final polish "in the manner used with respect to candlesticks plated" on copper."

[Printed, 4*d.* No Drawings.]

A.D. 1791, March 3.—N° 1795.

BEESLEY, James.—This is an invention of "plated pokers," *tongs, and shovels* (commonly called fire irons), and fenders" *of all patterns.*"

"The usual fire utensils called fire shovels, pokers, tongs, and "fenders, being commonly made of iron and steel, which require "much trouble in cleaning; in order to lessen this trouble, I "plate these utensils with silver, either with hard or soft solder. "The method of plating with hard solder (which will last longer "than the soft) is, by fixing on the iron or steel a body of silver "according to the pattern, and binding it on with wire and so "much silver solder, according to the size. It is heated in charcoal fire until it becomes red hot for the solder to melt, and that "becomes fast to the iron or steel. The method of plating with "soft solder is, by fixing the silver on the iron, steel, copper, "brass, or on a composition of other metals and afterwards "tinning the same; but as tin does not require much heat, "instead of heating it red hot I just melt the tin. It is soldered "with the same by applying rosin to it when it is hot. I plate "the shovels, tongs, or pokers made of copper, brass, or composition, with soft solder and iron or steel ones with either "hard or soft solder. I make the fenders of silver, plated copper, "brass, or composition of metals, by piercing them to any pattern "of a stove, and putting on mouldings made of iron, steel, "copper, brass, or composition to keep it in its right form, and "rivetting or soldering the same to the fender; and putting a "fixture on the inside of the fender makes it compleat."

[Printed, 4*d*. No Drawings. See Rolls Chapel Reports, 6th Report, p. 144.]

A.D. 1804, January 26.—N° 2749.

ALDERSON, George.—A "new invented manufacture of metal "pipes, the same being lead lined with tin in a manner and by a "process or processes entirely new, to be used in all cases to "which lead pipes are applicable."

A polished iron rod or core is introduced into the centre of a suitable mould, and the molten lead is poured therein. As soon as the lead is set, the said iron core is drawn out, and a similar core of smaller diameter is inserted into the mould and the molten tin is poured therein. Upon drawing out the last mentioned rod or core and opening the external mould, the cast pipe appears, and may be submitted to the operation of drawing when quite cold.

According to another method, the tin pipe may be first cast *upon a small core* and in a small mould; the core and pipe may then be removed to a larger mould, and the lead thereby cast round the said tin pipe.

Another plan consists in casting the lead pipe upon a tin pipe as a core.

A tin pipe upon a core may be inserted into a lead pipe, and the whole passed through a draw plate.

When the short thick pipe is produced by casting, it must be drawn to the proper length and substance by any of the common processes, but must have a central rod to preserve the inside of the pipe; the rod must afterwards be drawn out.

[Printed, 4*d*. No Drawings. See Repertory of Arts, vol. 5 (*second series*), p. 413; and Rolls Chapel Reports, 6th Report, p. 153.]

A.D. 1818, July 24.—N° 4284.

BLAKEMORE, Richard, and JAMES, John.—" A new kind " of plate, which we denominate amophous" [amorphous?] " metal plates, and likewise a certain improved and more perfect " method or methods of chrystalizing or rendering chrystalizable " the surface of tin plates or iron or copper plates tinn'd, which " plates we call amorphous metal plates."

" Our invention or discovery consists in adding to the tin, " whether grain, refined, or common, used in the manufacture of " tin plates a mixture or alloy of some or any other metal or " semi-metal capable of uniting in fusion with tin or of any two " or more of such metals or semi-metals, which said metals or " semi-metals fuse or become fluid, or, being in a state of fusion, " cool or become fixed at a different degree of heat or tempera- " ture from that of tin; and so that the quantity of such metals " or semi-metals so added to or alloyed with the tin be sufficient, " and not more than sufficient, to produce or leave upon the " surface of the sheet or plate, after the process is completed, " evident and visible marks or impressions of crystallization."

" The metals or semi-metals we have found most convenient " and proper for this purpose are zinc, bismuth, copper, lead, " and brass."

[Printed, 4*d*. No Drawings. See Repertory of Arts, vol. 34 (*second series*), p. 198; and Rolls Chapel Reports, 7th Report, p. 120.]

A.D. 1822, April 16.—N° 4667.

DANIELL, William.—An invention in "the rolling of iron " into bars used for making or manufacturing tin plates."

"My said invention consists of an improvement in the mode of "rolling iron to be used for tin plates, and consists in rolling the "iron (to be used for tin plates) perpendicularly between a pair "of rolls with groves of different gradations, the iron being previously cut with a pair of shears or any other instrument into "pieces of four inches and a half an inch square, more or less (but "I generally prefer that size), the first grove in the rolls being so "cut or formed as to admit each of the pieces of iron (singly) to "pass through perpendicularly, and the successive groves in the "rolls being such that the pieces of iron may come out of the "last grove reduced to a proper thickness for the future stage of "the manufacture of iron for tin plates. By the means of rolling "the iron perpendicularly in the manner which I have described, "the inside of the piece of iron is brought to the surface, and "the imperfection it contains, instead of being dispersed and "intermixed throughout, is forced to the edge and ends; the "quality of the iron for tin plates is thereby much improved, and "the number of tin plate wasters are thereby reduced."

[Printed, 4*d.* No Drawings. See Repertory of Arts, vol. 43 (*second series*), p. 73; and London Journal (*Newton's*), vol. 6, p. 75.]

A.D. 1832, January 24.—N° 6214.

MAYBURY, Joseph, MAYBURY, John, and MAYBURY, Joseph, the younger.—"Certain improvements in polishing or "planishing and manufacturing or making ladles, spoons, and "other articles for culinary, domestic, and other purposes made "of iron and tinned."

The Specification describes and the drawings show a pair of planishing rolls for planishing tin plates, the said rolls being mounted in a frame and fitted with driving wheel and shaft, coupling boxes, spindles, and spur pinions; elevating screws adjust the separation between the rolls to the thickness of the plates to be planished. The said rolls are made of steel or other metal that will take a high polish.

"The manner in which we make and planish spoons and ladles "is as follows:—Cut the spoon or ladle out of the best strip or "sheet iron by means of a press; then anneal, pickle, and tin it "in the usual way before it is bowled; afterwards pass it thro' "the planishing rolls which planishes it; it is then bowled in a "pair of highly planished bowling or sinking dies in the manner "heretofore used, except that the dies are highly planished or

" polished; when bowled it is set by hand, and finished in the " usual way by the polishing bob."

[Printed, 6*d.* Drawings. See London Journal (*Newton's*), vol. 3 (*conjoined series*), p. 252; and Register of Arts and Sciences, vol. 7 (*new series*), p. 137.]

A.D. 1838, May 3.—N° 7630.

BERRY, Miles.—(*A communication.*)—" A new and improved " method or process of alloying metals by cementation, particu- " larly applicable to the preservation of copper, wrought or cast " iron, and other metals, and thereby operating a change in the " appearance of their surface, and giving them more brilliancy."

1st. Copper is rendered inoxidizable by the following process: —It is cleansed, covered with a mixture of charcoal and zinc powder, and raised to a red heat in a furnace for a longer or shorter period according to the bulk of the article and the colour to be given to it.

2nd. For the preparation of iron, two parts of zinc and three parts of copper are melted together, and the cleansed iron is plunged therein. A flux or layer of sal ammoniac is preferred to be used for excluding the atmosphere from the surface of the melted alloy. The article is then placed in charcoal powder in a furnace, and exposed to a strong red heat until the fumes of the zinc begin to abate; it is then (still covered with charcoal) plunged into water or allowed to cool slowly.

3rd. In regard to the process for iron, a modification consists of pulverising the above-mentioned alloy when mixed with borax, and dipping the iron (previously cleansed and greased) into the metallic powder thus produced; the article is then plunged into the charcoal powder and heated as above set forth.

4th. The cleansed iron is dipped into a solution of sulphate of copper, plastered with potter's earth, covered with a layer of pulverised zinc and borate of soda, covered with charcoal powder, placed in a furnace, and treated as set forth above.

[Printed, 4*d.* No Drawings. See London Journal (*Newton's*), vol. 15 (*conjoined series*), p. 91.]

A.D. 1841, August 27.—N° 9055.

MOREWOOD, Edmund.—" An improved mode of preserving " iron and other metals from oxydation or rust."

This invention consists of " the preserving of iron and other " metals capable of being tinned and fusing at a temperature of " not less than one thousand two hundred degrees of Fahrenheit,

" from oxidation by tinning them and then dipping the tin
" covering or surface in molten zinc," " or otherwise coating the
" said tin covering or surface with zinc," so that " contact shall
" take place between the surfaces of the zinc and tin."

"The zinc prevents the destructive influence of the tin upon
" the iron or other metal when tin alone is used," and "the tin
" lessens the destructive influence of the iron or other metal upon
" the zinc when zinc alone is used to cover the said iron or other
" metal."

The tinned metal is immersed in pure molten zinc, the surface of which is covered with a flux of sal ammoniac. The article is suffered to remain in the molten zinc, which is retained as nearly as possible at the melting point, until, on drawing it out slowly, the zinc surface presents a smooth appearance.

"After taking the tinned metal out of the molten zinc I im-
" merse it in clean water almost immediately whilst the plate is
" still hot, and before the coating has become set and hard, and
" then scrub and clean it therein, and afterwards dry it in bran
" or sawdust."

A Disclaimer was filed on December 11th, 1845, confining the invention to preserving iron from rust by tinning it, and then dipping the tin surface in molten zinc.

[Printed, 4*d.* No Drawings. See Repertory of Arts, vol. 18 (*new series*) p. 170; London Journal (*Newton's*), vol. 24 (*conjoined series*), p. 117; and Mechanics' Magazine, vol. 36, p. 238.]

A.D. 1848, December 4.—N° 12,358.

DRAYTON, Thomas.—" Improvements in silvering glass and
" other surfaces."

Although this invention relates principally to silvering glass, the solution used for this operation " will deposit silver upon
" metals in a very perfect manner."

The solution is prepared by mixing spirits of wine with an ammoniacal solution of nitrate of silver; the liquid is allowed to stand for some hours, and then is filtered for use. Grape sugar is dissolved in spirit and water, added to the filtered liquid, and the whole allowed to stand a few hours.

To promote the deposit upon glass, heat (160° Fahrenheit) is used.

[Printed, 4*d.* No Drawings. See Repertory of Arts, vol. 14 (*enlarged series*), p. 38; London Journal (*Newton's*), vol. 34 (*conjoined series*), p. 414; Mechanics' Magazine, vol. 50, p. 543; Patent Journal, vol. 7, p. 118; and Engineers' and Architects' Journal, vol. 12, p. 251.]

A.D. 1851, February 28.—N° 13,536. (* *)

MILLWARD, William.—"Certain improvements in electro-"magnetic and magneto-electric apparatus," consisting of:—

1st. "A new mode of charging or magnetizing iron and steel "bars, to be used either as permanent magnets or electro-mag-"nets." This is effected by using "an electro-magnet formed "by a current produced from a magneto-electrical machine, "instead of the current produced from a voltaic battery as here-"tofore." The magneto-electric machine preferred consists of magnets of "the U" or horseshoe form, with all the north poles ranged on one side and the south poles on the other; the commutator acts upon all the magnets "at the same instant, so that "the current of electricity always passes in one direction," and the whole magnetic surface is "in combination at one time."

2nd. Two "new forms of magneto-electrical machines."

In the first, the armatures may revolve either between the poles of horseshoe magnets "or in face of them." Instead of the permanent horseshoe magnets being of steel, they are of cast iron, or of soft iron, with steel magnets placed on or around them out of the influence of the armatures.

The second machine consists of a fixed horseshoe permanent magnet and a revolving "commutator" of soft iron, with a brass centre between the permanent magnet and fixed coiled "arma-"tures." [The "commutator" would here appear to be also a keeper to the permanent magnet.]

[Printed, 6*d*. Drawing. See Repertory of Arts, vol. 18 (*enlarged series*), p. 199; Mechanics' Magazine, vol. 55, p. 198; and Patent Journal, vol. 11, p. 267.]

A.D. 1852, April 20.—N° 14,080.

RIDGWAY, John.—This invention consists of "the application "of the art of 'electrotype' or 'electro metallurgy' to the orna-"menting or decorating of articles of glass, china, earthenware, "and other ceramic manufactures," so that "the surface of the "non-conducting body is so prepared that the metal deposited "thereon shall become alloyed or combined therewith."

To effect this object, "a new glaze or coating substance" of a porous character is applied to the surface of the articles, so as to give them "an affinity for copper as a first coating," by sub*mitting them* "to strong alcohol, or a gelatinous solution, or a "*thin coating of* mastic varnish;" or a varnish of asphalt and mastic "fused and dissolved in spirits of turpentine;" immersing them, when the above coating is nearly dry, in a solution of "phosphorus reduced by bisulphuret of carbon;" immersing them in "nitrate of silver;" setting them aside to dry; making their surfaces conductable by brushing them over with highly pulverized carburet of iron and sulphate of copper intermixed, until a high polish is attained; corroding the articles "by means "of the fumes of hydrofluoric acid;" and electro-coating them with copper by an acid solution of its sulphate to which sulphate of zinc has been added. The articles are then removed from the depositing vat, cleansed, dried, and polished; any grease is also removed by boiling in a solution of pearlash or "American "potash."

The surface of the copper is then prepared by immersion in a solution of nitrate of mercury, for electro-silvering or electro-gilding. Other metals besides gold or silver may be electro-deposited to ornament the surface prepared as above described.

[Printed, 4*d*. No Drawings. See Mechanics' Magazine, vol. 57, p. 374.]

A.D. 1852, December 8.—N° 996. (* *)

SYMONDS, John, and MOUCHET, George.—"An improved "mode of cleaning or scaling metallic surfaces."

"To avoid the waste and deterioration of metal" consequent upon the use of the ordinary modes of cleaning and scaling metallic surfaces, the articles to be cleaned are immersed in the pickle in metallic contact with an electro-positive metal, such as zinc, the zinc being in a porous vessel placed in the pickle.

A tank for cleaning iron or other plates is shown, in which the porous cell is in the middle, between two sets of plates that are wedged into guide frames having grooved iron notches. The arrangements are, however, varied according to the article to be cleaned.

The pickle employed is a solution of salt, with or without the addition of "sulphuric or muriatic acid;" in the Provisional Specification it is stated "sulphurous or muriatic."

Cast iron may, in some cases, be used instead of zinc.

When several tanks are used, the zinc and articles to be cleaned are connected into a galvanic series.

[Printed, 6d. Drawing.]

A.D. 1853, March 4.—N° 553. (* *)

STIRLING, John Davie Morries.—(*Provisional protection only.*)—" Improvements in manufacturing coated metal."

Metals that have been coated by electrical or chemical action are to be subjected to a rolling process, which reduces the thickness and planishes the surfaces of the metals.

[Printed, 4*d*. No Drawings.]

A.D. 1854, February 2.—N° 263. (* *)

PARIS, Charles Emile. — (*Provisional protection only.*) — " Certain improvements in covering with metals certain metallic " surfaces."

Articles of metal which have been coated with a vitreous compound, receive a second coating of metal by applying the metal thereto in the form of sheets or powder, and fusing it.

[Printed, 4*d*. No Drawings.]

A.D. 1854, November 15.—N° 2417.

WARNER, Arthur.—(*Provisional protection only.*)—" Improve-" ments in combining sheets of copper or its alloys with lead, " tin, zinc, nickle, gold, silver, platinum, or alloys containing " these metals, or some of them, with or without the addition of " copper, antimony, bismuth, arsenic, manganese, or mercury."

" This invention consists of combining sheets of copper or its " alloys with sheets of the other metals mentioned ; and this I " do, by preference, by flushing or coating one surface of a sheet " of copper or its alloys with suitable solder, & then causing " such surface to adhere to a sheet of one or other of the other " metals mentioned, by heat applied through the sheet of copper " or its alloys, aided by pressure, to keep the two surfaces in " contact when the melting of the solder and the cooling of it " between the surfaces are taking place.

" When the sheets of metal are hard enough they may have " one of their surfaces coated with solder, as well as or in place " of the copper, and heat to melt the solder may be applied " externally to such hard sheets, as well as or in place of to the " external surfaces of the sheets of copper or its alloys."

[Printed, 4*d*. No Drawings.]

A.D. 1855, May 12.—N° 1067.

WARNER, Arthur. — (*Complete Specification, but no Letters Patent.*)—" Improvements in combining sheets of copper or its

" alloys with lead, tin, zinc, nickle, gold, silver, platinum, or " alloys containing these metals, or some of them, with or without " the addition of copper, antimony, bismuth, arsenic, manganese, " or mercury."

" This invention consists of combining sheets of copper or its " alloys with sheets of the other metals mentioned," preferably " by flushing or coating one surface of a sheet of copper or its " alloys with suitable solder, and then causing such surface to " adhere to a sheet of one or other of the other metals mentioned, " by heat applied through the sheet of copper or its alloys with " suitable solder, and then causing such surface to adhere to a " sheet of one or other of the other metals mentioned, by heat " applied through the sheet of copper or its alloys, aided by " pressure, to keep the two surfaces in contact when the melting " of the solder and the cooling of it between the surfaces are " taking place. When the sheets of metal are hard enough, they " may have one of their surfaces coated with solder, as well as or " in place of the copper, and heat to melt the solder may be " applied externally to such hard sheets, as well as or in place " of to the external surfaces of the sheets of copper or its " alloys."

Sheets of copper flushed with solder are united with sheets of lead by moistening with the ordinary solution for soldering, and going through the above-described process. To apply heat, the iron pressing table is furnished with a metal heater. Sheets of copper coated with solder may be combined directly with sheets of zinc or alloyed zinc by the above process. A similar process is used when the sheets of copper or alloy are to be combined with the other metals mentioned above.

The sheet of copper or alloy may be coated with tin before applying the solder.

[Printed, 4*d*. No Drawings.]

A.D. 1855, August 4.—No. 1770.

WARNER, Arthur.—" Improvements in coating or combining " sheet iron and steel with sheet lead, zinc, tin, copper, or alloys " of such metals."

"This invention consists of coating or combining sheet iron " and sheet steel with sheet lead, zinc, tin, copper, or alloys of " such metals, by applying soldering metal between them, and

" subjecting them to heat whilst pressed together in a flat or " nearly flat state, the heat being applied through one or both " of the metals, so as to melt the soldering metal which is between " them. The soldering metal may be most conveniently applied " by coating one or both of the sheets or pieces of sheet metal " which are to be combined, though this is not essential."

When the said combined sheets are used for ship-building, it is preferred to employ lead as an interposed metal between the sheet iron and sheet copper, "as by so doing the copper or its alloys " will not be preserved by galvanic action at the expence of the " iron," but in other cases a sheet of copper or of its alloys may be applied to a sheet of iron or steel without the interposition of lead. When lead is interposed, the iron should be coated all over with lead. The soldering metal is flushed over one of the surfaces of the sheet copper (on a heated table) and the sheet iron is pressed thereon until the combination is cold. The same process is used when zinc or lead is substituted for copper, except that the soldering metal is flushed on to the sheet iron; tin, alloyed in order to harden it, is treated in the same way. The solder used should melt at a temperature below that at which either of the metals or the resulting alloy melts.

[Printed, 4*d*. No Drawings.]

A.D. 1856, March 31.—N° 776.

CORNFORTH, Henry.—" A new or improved manufacture of " plated tea pots and coffee pots, and other vessels and articles " of like manufacture."

This invention consists in manufacturing the said articles "of " the metal zinc, plated or coated with silver by the ordinary " electro-metallurgical processes." It is preferred to coat the article first with copper and afterwards with silver. Either commercial zinc or any alloy consisting mainly of zinc may be used. In coating the said articles with copper, an electro-deposit is obtained thereon from a solution of cyanide of copper; this electro-deposit may be thickened by deposition from a solution of sulphate of copper or other salt of copper more easily decomposed than the cyanide. A solution of cyanide of silver is employed for the purpose of depositing silver upon the said articles by means of electricity. Sometimes a coating of tin, or an easily fusible alloy of lead and tin, is applied to the articles of zinc

prior to the application of the coating of copper thereto. The said coating of tin or alloy of lead and tin is applied by fusing the same on the zinc.

[Printed, 4*d*. No Drawings.]

A.D. 1856, September 19.—N° 2195.

BISSEKER, William John.—(*Provisional protection only.*)—
" Improvements in strings or wires used in or on musical instru-
" ments."

"The objects of my improvements are to render the tone or
" sound of any string or wires used for musical purposes of a
" very superior kind to that useually obtained from the strings or
" wires ordinarely used; to encrease their dureableity as regards
" wear and atmospherical effects, and at the same time imparting
" elegance of appearance.

"The improvements consist in depositing by chemical means,
" or plateing or coating by any process in which such covering
" can be produced, a coating of gold, or gold with its alloys,
" upon strings or wires used in or on musical instruments, and
" also for coating the metal strings used in the pianoforte or
" other instruments with gold, silver, or other metals, by
" depositing by chemical means, or plateing or coating by any
" process in which such covering can be produced; also for
" covering musical strings or wires with gold wire, or gold wire
" and its alloys."

[Printed, 4*d*. No Drawings.]

A.D. 1856, December 3.—N° 2872.

NEWTON, William Edward.—(*A communication from Charles Nègre.*)—(*Provisional protection only.*)—" Improved processes for
" ornamenting metallic surfaces, and for producing surfaces in
" intaglio or in relief, for printing purposes."

"The object of this invention is to reproduce copies of photo-
" graphic images, drawings, and prints, by obtaining from them,
" by the action of light and the employment of chymical and
" galvanic operations, engraved plates, either in intaglio or in
" relief, upon iron, steel, copper, and other metals; also to pro-
" duce damaskened designs, formed by metals of various colors;
" also designs formed of different colors, by means of several
" engraved plates registering one with the other; also designs of

" different colors, gold and platinum, upon porcelain, earthenware, " stoneware, &c.; also enamel or 'nielle' work, and inlaid work " upon metals, marble, stone, &c."

The following portions of this invention involve the coating of metals permanently with metals :—

A plate of polished metal is overlaid with a layer of sensitive organic matter which is acted upon by light: those parts which have been protected from light are then removed by a solvent, and a layer of gold or other metal is galvanically deposited upon the portion of polished metal that is laid bare.

Metal may be electro-deposited in the sunken parts of an etched design.

A proof in printer's ink may be used as a reserve to obtain a layer of another metal upon the polished metal by means of galvanic deposition.

A photograph or drawing, immersed in a solution of a metallic salt, and exposed to vapour of phosphorus, has the metal reduced in the dark parts. " A deposit of copper is effected upon all the " parts of a design thus metallized."

[Printed, 4*d*. No Drawings.]

A.D. 1857, January 1.—N° 5.

NOUALHIER, Eugène Théodore, and **PRÉVOST**, Jean Baptiste. — " Improvements in applying metals over hard, " vitrified, or any other surfaces by galvano-plastic process."

To coat vitrified or enamelled surfaces, the object is varnished or covered with gold size, then with copper leaf, and the whole left to dry completely; the said object is then electro-coppered (using a solution of sulphate of copper), cleaned, " smoothed by " filing off the asperities," " finished with pumice stone," and polished. Instead of using copper leaf to make the surface conductable, " German gold dust or bronze powder containing " much mercury " may be employed; it is prepared by trituration with common salt; hot water is poured over the mixture, the salt dissolves, and the resulting deposit, dried, is fit for use.

To preserve the silvering of looking-glasses from damp, the glass is dipped into a melted mixture of bee's-wax and tallow, as soon as it is cool the parts to be electro-coppered " are pre- " pared with metallic powder, and treated in the same manner " as before mentioned."

To metallize soft surfaces, a human corpse for instance, the following process is employed:—All the apertures are stopped with modellers' wax, the body is placed in a suitable attitude, and pulverised nitrate of silver spread over it by a brush or otherwise; it is then electro-coppered in a bath of sulphate of copper, "the " result being a metallic mummy."

To electro-coat with iron, a solution of protosulphate of iron is used.

The electro-coppered articles "may receive afterwards another " coating of either silver, gold, or platinum."

[Printed, 4*d*. No Drawings.]

A.D. 1857, January 22.—N° 189.

WARNE, JAMES.—"A new combination of metals applicable to " decorative and useful purposes, part of which invention is " applicable also to the method of combining metals and alloys " of metals."

1st. "Forming a new combination of metals applicable to " covering the tops of bar or shop counters and tables, and " to other decorative and useful purposes, by soldering or fusing " together the following metals or alloys of metals, so as to " produce a hard metallic surface resembling silver, inseparably " combined with a body or back of baser metal or alloy. The " alloy employed for the surface consists of the following metals, " namely, block or ingot tin, nickel, bizmuth, and cobalt."

2nd. "A novel method of soldering or uniting by fusion the " above alloys of metals" and other metals and alloys. "The first " metal or alloy in a liquid or fused state is to be poured into " a vessel or mould to the required depth, and when just set a " heated perforated metal plate is placed upon the surface to fuse " the same. As soon as the metal or alloy rises through the " perforations, the plate is withdrawn and the second metal or " alloy is poured in. Thus a block or ingot is produced formed " of two distinct metals or alloys, firmly and inseparably com- " bined or soldered, which may then be rolled out into sheets of " the required thickness, and the two metals or alloys both being " of the same hardness will spread or draw evenly, and their " relative proportions will always remain the same, however thin " the plate may be rolled out."

[Printed, 4*d*. No Drawings.]

A.D. 1857, March 25.—N° 826. (* *)

OUDRY, Charles François Léopold.—" Improvements in " the preservation of articles of cast, wrought, rolled, and forged " iron, zinc, and other metals or alloys of metals against oxida- " tion, from humidity and other destructive effects of air and " water."

This invention consists in electro-depositing pure copper to any desired thickness upon the above-mentioned articles, " after being " first coated with one or several coats of a composition in a liquid " or semi-liquid state, serving as an isolating and metallising " medium."

The process is as follows :—The articles are brushed, " dipped " once or several times into a hot or cold liquid varnish (the inter- " mediate coating)," withdrawn to dry, and dipped into another " liquid or metallic varnish." When the varnish is perfectly dry, the articles are electro-coated with copper by means of a solution of sulphate of copper, " which may be acidulated," washed, and dried.

The varnishes are composed of " resinous, gummy, or bitumi- " nous matters, combined with greasy or essential oils and " metallic salts, such as minium, white lead, litharge, cinabar" [cinnabar ?] " and other agents having analogous properties."

After copper is deposited upon the above-mentioned articles, they can, if required, be gilt, bronzed, or silvered.

[Printed, *4d.* No Drawings.]

A.D. 1857, August 19.—N° 2197.

WALL, Arthur.—" Improvements in amalgamating metals."

The first part of this invention relates to a mixture of metals which may be used for sheets for sheathing ships, also for the bearings of axle boxes, and for other purposes. The mixture contains copper, lead, zinc, bismuth, and mercury.

For sheathing ships the following process is preferred :—Zinc sheets of a convenient size are coated with copper by immersion in an acid solution of cupric sulphate. The sheets are " allowed " to remain until their own natural affinities or currents of elec- " tricity, generated by either a thermal or voltaic battery, pro- " duce the complete amount of covering required." " This " process may in a great measure be dispensed with by using the " battery, per se, formed by two metals of opposite electric con-

" ditions, such as is formed by mercury and zinc. This is " effected by dipping the zinc previous to placing it in the sul- " phate of copper bath, in which sulphuric acid and water forms " the menstruum, and in which mercury is dissolved in the pro- " portion of an ounce of solution, specific gravity, of mercury to " 80 of water and acid. The zinc being first dipped in this bath " for a few seconds (on the same principle as that explained by " Madeiros in the Specification of his Patent, 1853,) and then " placed in the copper bath, makes a deposit to any required " amount uniformly and complete. When the sheet is with- " drawn from the copper bath it is replunged into the mercurial " bath, when complete amalgamation of the surface and moli- " cules takes place, and the operation is finished. Metal, such " as thin sheets of lead or thin sheets of copper, are similarly " treated by applying any of the oxides of any of the three " metals to the other, or any two of them, or all together, care " being taken that the last covering be mercury."

[Printed, 4*d*. No Drawings.]

A.D. 1858, April 15.—N° 814.

DAVIES, Charles, JONES, William, and JONES, John. —(*Provisional protection only.*)—" An improved method of finish " ing tinned, terne, or lead plates without the use of grease."

" The object of this invention is to dispense with the use of " grease in the finishing of tinned, terne, or lead plates, and the " nature of the invention consists in the employment of hot air " instead of hot grease for such purpose, the plates to be " finished being placed in a stove of iron or brickwork of a suit- " able construction instead of being immersed in a grease pot, " as ordinarily practised in such manufactures."

[Printed, 4*d*. No Drawings.]

A.D. 1858, June 3.—N° 1255. (* *)

LIEBIG, Justus Baron Von.—" Improvements in protecting " the silvered surface of mirrors and other articles of glass."

This invention " consists in protecting the silvered surface of " mirrors and other articles of glass, by depositing thereon a " coating of copper or gold or other metal by the agency of elec- " tricity, combined with the use of a neutral solution of the " double salt tartrate of oxide of copper and soda (potash or

" ammonia), or an alkaline solution of gold, nickel, or other " metals."

The alkaline gold solution consists of caustic soda added to the double chloride of gold and sodium.

"The alkaline solution of nickel is prepared by adding a slight " excess of ammonia to a solution of one part of sulphate of " nickel in (40) forty parts of water."

[Printed, 4*d.* No Drawings.]

A.D. 1858, June 29.—N° 1468.

GREAVES, HUGH.—(*Provisional protection only.*)—" Improvements in apparatus for moulding, casting, and coating metal " articles."

The first part of this invention relates to a horizontal frame, capable of revolving upon a vertical axis. This frame is situated above a bench, upon which the moulding boxes may rest when they are required so to do. The moulding boxes are suspended to the circumference of the frame, and are constructed with gudgeons, so as to allow of the said boxes being turned over to facilitate the moulding. By means of this frame the boxes can be brought successively opposite to the cupola, " where the metal " is run into them. They are subsequently emptied, and by the " rotation of the frame again pass into the moulder's hands " to be refilled, and again move round to the casting point as " before."

For coating articles with either a metallic or other substance, the inventor makes use " of a frame or series of arms revolving " upon or with a horizontal axis, beneath which is a vessel or " cistern containing the coating material in a fluid state. The " articles to be coated are suspended at intervals to the upper " part of one side of the frame, which being made to revolve by " manual or other power, causes the articles to pass through the " fluid coating, and to emerge therefrom at the side of the axle " opposite to that at which they entered, they are then detached, " and at once deposited in a carriage brought close up to the " frame for removal as desired."

[Printed, 4*d.* No Drawings.]

A.D. 1858, December 14.—N° 2859. (* *)

WEBSTER, JAMES.—" A new or improved method of recovering " copper and zinc from liquids which have been employed to dip

" or pickle articles made of brass or other alloys containing " copper and zinc."

This consists "in precipitating metallic copper from the " saturated or partially saturated dipping liquid or pickle by " means of metallic zinc." "All the copper is precipitated " in the metallic state, while the solution on evaporation yields " crystals of zinc salt. The whole of the zinc originally contained in the solution, as well as that dissolved during the " precipitation of the copper, is obtained by the evaporation of " the liquid." "The dipping liquid or pickle from which the " copper and zinc are to be recovered is pumped" into a vat or cistern, in which is placed zinc (in strips or granulated) in excess, and the whole is stirred; after precipitation of the copper the liquid is drawn into a lower vat, and after subsidence of any suspended metallic copper it is drawn into a boiler, where by evaporation all the zinc "is recovered in the form of zinc salt."

[Printed, 6*d*. Drawing.]

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- Used, in a heated state, to electro-deposit aluminum;
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  - Putnam, 41.
- With metals in general
  - Graham, 5.
  - Beslay, 20.
  - Mitchell (*Mitchell*), 33.
  - Parsons, 38.
  - Johnson (*Girard*), 38.
  - Morewood, 39.
  - Allan, 53.
- With nickel;
  - Thompson, 49.
- With palladium;
  - Thompson, 49.
- With pewter;
  - Bent, 67 (*Appendix*).
  - Alston, 69 (*Appendix*).

Iron, &c.—*cont.*

- With platinum;
  - Busch, 29.
  - Thompson, 49.
  - Thompson, 54.
- With silver;
  - Homer, 66 (*Appendix*).
  - Bennett, 68 (*Appendix*).
  - Roberts, 70 (*Appendix*).
  - Beesley, 70 (*Appendix*).
  - Busch, 29.
  - Thompson, 49.
  - Allan, 53.
  - Thompson, 54.
  - Newton (*Savage*), 62.
- With tin;
  - Bent, 67 (*Appendix*).
  - Bennett, 68 (*Appendix*).
  - Alston, 69 (*Appendix*).
  - Beesley, 70 (*Appendix*).
  - Blakemore and James, 72 (*Appendix*).
  - Daniell, 72 (*Appendix*).
  - Maybury, Maybury, and Maybury, 73 (*Appendix*).
  - Morewood, 74 (*Appendix*).
  - Warner, 79 (*Appendix*).
  - Banks and Morgan, 2.
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  - Putnam, 41.
  - Russ, 42.
  - Thompson, 49.
  - Morewood, 65.
- With zinc;
  - Blakemore and James, 72 (*Appendix*).
  - Morewood, 74 (*Appendix*).
  - Warner, 79 (*Appendix*).
  - Graham, 5.
  - Chavasse, Morris, and Haines, 14.
  - Madge, 17.
  - Harrison, 27.
  - Parsons, 38.
  - Johnson (*Girard*), 38.
  - Putnam, 41.
  - Bousfield (*Perkins*), 63.

Iron, salts of. *See*, Perchloride of iron; and Proto-sulphate of iron.

Kerosene:

- Clark (*Holley*), 36.

Lead, coating metals and alloys with:

- By electro-deposition;
  - Weil, xii.
- By immersion of the article to be coated in a bath of molten lead;
  - Bagley and Mincher, 1.
  - Banks and Morgan, 2.
  - Taylor and Price, 8.
  - Kelly and Shakespeare, 9.
  - Morewood and Whytock, 16.
  - Madge, 17.
  - Nurse and Nurse, 21.
  - Harrison, 27.
  - Tomkins, 30.
  - Morgan, 32.
  - Johnson (*Girard*), 38.
- By various processes;
  - Bent, 67 (*Appendix*).
  - Warner, 78 (*Appendix*).
  - Warner, 79 (*Appendix*).
  - Chavasse, Morris, and Haines, 14.
  - Putnam, 41.

Lead, coating or covering:

- With gold;
  - Jackson, 66 (*Appendix*).
- With tin;
  - Alderson, 71 (*Appendix*).
  - Bennett, 10.
  - Johnson (*Sebille*), 19.
  - Jones, 30.
  - Kinder, 33.
  - Shaw, 35.
  - Newton (*Hamon*), 37.

Lead used to reduce bismuth from its solution:

- Patera, xiii.

Looking glasses, coating their silvered surface with copper, gold, or nickel:

- Liebig, 85 (*Appendix*).

Magnesium:

- Precipitates nearly all the metals from their neutral solutions:
  - Phipson, xii.
- Precipitates certain metals (besides other products) from their neutral solutions;
  - Commaille, xiv.

Magneto-electricity:

- Applied to the deposition of metals;
  - Millward, 76 (*Appendix*).
  - Newton (*Beardslee*), 8.

Mercury, salts of. *See,* Nitrate of mercury.

Metals in general:
- Deposited by galvanic action;
  - Dalrymple, 23.
  - Bonneville (*Thirault*), 28.
- Deposited by heat;
  - Paris, 78 (*Appendix*).
  - Greaves, 86 (*Appendix*).
- Deposited by immersion in molten metal;
  - Morewood, 50.
  - Morewood, 58.

Mirrors, coating their silvered surface with copper, gold, or nickel:
- Leibig, 85 (*Appendix*).

Muriatic acid (*hydric chloride*):
- Used as a cleansing solution;
  - Bagley and Mincher, 1.
  - Knight, 34.
  - Thompson, 49.

Muriatic acid saturated with zinc (*zinc chloride*):
- Used as an electro-depositing solution;
  - Bagley and Mincher, 2.

Nickel, coating metals with:
- By electro-deposition;
  - Liebig, 85 (*Appendix*).
  - Becquerel and Becquerel, xii.
- By heat:
  - Warner, 78 (*Appendix*).
- By immersion in the molten metal;
  - Tomkins, 30.
  - Thompson, 49.

Nickel, salts of. *See,* Sulphate of nickel.

Nitrate of mercury (*mercurous nitrate*):
- Used to prepare copper for receiving a deposit of silver;
  - Ridgway, 76 (*Appendix*).

Nitrate of silver (*argentic nitrate*):
- Used in a depositing solution;
  - Cimeg, 4.
  - Brooman (*Miller*), 10.
  - Weil, 44.
- Used to reduce the metal by electrolysis;
  - Becquerel and Becquerel, xii.

Oxide of copper, used to renew depositing solutions:
- Weil, xii.

Palladium, coating metals with:
- By electro-deposition;
  - Thompson, 49.
- By means of solder;
  - Northwood, 56.

Palm oil:
- Used as a flux;
  - Banks and Morgan, 2.

"Pearl potash" (*potassium carbonate*):
- Used in a depositing solution;
  - Moore, 48.

Perchloride of iron (*ferric chloride*):
- Used in a depositing solution;
  - Weil, 44.

Pewter, coating metals with:
- By heat;
  - Bent, 67 (*Appendix*).
  - Alston, 69 (*Appendix*).

Platinum, coating metals with:
- By electro-deposition;
  - Noualhier and Prévost, 82 (*Appendix*).
  - Becquerel and Becquerel, xii.
  - Busch, 29.
  - Thompson, 49.
  - Thompson, 54.
- By immersion;
  - Hunt, 19.
- By means of solder;
  - Warner, 78 (*Appendix*).
  - Northwood, 56.

Platinum, coating or covering:
- With copper;
  - Varley, 59.

Platinum, salts of. *See,* Bichloride of platinum.

Potash, caustic (*potassium hydrate*):
- Used as a cleansing solution;
  - Thompson, 49.
- Used in an electro-depositing solution;
  - Thompson, 54.

Potassium, salts of. *See*, Alum; Carbonate of potash; Chloride of potassium; Cyanide of potassium; Felspar; "Iodide of potash;" "Pearl potash;" "Prussiate of "potash;" and Rochelle salt.

Preparation of metallic surfaces to receive metallic coatings:

Symonds, and Mouchet, 77 (*Appendix*).
Whytock, 22.
Lauth, 24.
Pughsley, 46.
Calvert and Johnson, xiii.
Newton (*Savage*), 62.
Bousfield (*Perkins*), 63.
Brooman (*Bernabé*), 64.

Protecting a metal from crystallization:

By means of a soft metallic coating;
Marshall, 5.

Proto-sulphate of iron (*ferrous sulphate*):

Used in a depositing solution;
Noualhier and Prévost, 82 (*Appendix*).

"Prussiate of potash" (*potassium ferrocyanide*):

Used in a depositing solution;
Moore, 48.
Thompson, 54.

Rochelle salt (*sodic potassium tartrate*):

Used in a depositing solution;
Cimeg, 4.
Weil, 44.

Rolling electro-coated metal:

Stirling, 78 (*Appendix*).

Rosin (*resin*):

Used as a flux;
Alston, 69 (*Appendix*).
Beesley, 70 (*Appendix*).
Banks and Morgan, 2.
Morewood and Whytock, 16.
Johnson (*Girard*), 38.
Morewood, 39.
Webster, 41.

Sal-ammoniac (*ammonium chloride*):

Used as a flux;
Bennett, 68 (*Appendix*).
Alston, 69 (*Appendix*).
Morewood, 74 (*Appendix*).
Banks and Morgan, 2.
Morewood and Whytock, 16.
Tomkins, 30.
Morewood, 39.
Webster, 41.

"Sal soda:"

Used as a flux;
Clark (*Holley*), 36.

Salt, common (*sodium chloride*):

Used in an electro-depositing solution;
Brooman (*Miller*), 10.

Silex (*silicic di-oxide*):

Used as a flux;
Clark (*Holley*), 36.

Silver, coating metals or alloys with:

By electro-deposition;
Ridgway, 76 (*Appendix*).
Cornforth, 80 (*Appendix*).
Gore, xi.
Parkes, 3.
Brooman (*Miller*), 10.
Weems, 12.
Becquerel and Becquerel, xii.
Busch, 29.
Moore, 40.
Weil, 44.
Thompson, 49.
Thompson, 54.

By heat;
Homer, 66 (*Appendix*).

By immersion;
Weil, 44.
Newton (*Savage*), 62.

By soldering;
Beesley, 70 (*Appendix*).
Warner, 78 (*Appendix*).
Robert, 35.
Northwood, 56.

By various processes;
Marston and Bellamy, 67 (*Appendix*).
Martin, 69 (*Appendix*).
Roberts, 70 (*Appendix*).
Drayton, 75 (*Appendix*).
Noualhier and Prévost, 82 (*Appendix*).
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Silver, coating or covering:
With copper;
Liebig, 85 (*Appendix*).
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With gold;
Liebig, 85 (*Appendix*).
Clark (*Kuhlmann*), 47.
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With nickel;
Liebig, 85 (*Appendix*).
With platinum;
Thompson, 49.

Silver reduced from its solution by means of cadmium:
Classen, xiii.

Silver, salts of. *See,* Chloride of silver; Cyanide of silver; and Nitrate of silver.

Soda, caustic (*sodium hydrate*)**:**
Used in a depositing solution;
Weil, 44.

Sodium, salts of. *See,* Auric sodium chloride; Borax; Carbonate of soda; Caustic soda; Chloride of aluminum and sodium; Cupric sodium tartrate; Cyanide of sodium; Hyposulphite of soda; Rochelle salt; "Sal "soda;" Salt, common; and Sulphide of sodium.

"Spanish White:"
Used as a flux;
Clark (*Holley*), 36.

Sulphate of baryta (*barium sulphate*)**:**
Used as a flux;
Clark (*Holley*), 36.

Sulphate of copper (*cupric sulphate*)**:**
Used in a depositing solution;
Ridgway, 76 (*Appendix*).
Cornforth, 80 (*Appendix*).
Wall, 84 (*Appendix*).
Mitchell (*Mitchell*), 33.
Weil, 44.
Weil, xii.
Brooman (*Bernabé*), 61.
Brooman (*Bernabé*), 64.

Sulphate of nickel (*nickel sulphate*)**:**
Used in a depositing solution;
Liebeg, 85 (*Appendix*).
Used to reduce the metal by electrolysis;
Becquerel and Becquerel, xii.

Sulphate of thallium (*thallium sulphate*)**:**
Used to reduce the metal by electrolysis;
Crookes, xii.

Sulphate of zinc (*zinc sulphate*)**:**
Used in a depositing solution;
Ridgway, 76 (*Appendix*).

Sulphide of sodium used to renew depositing solutions:
Weil, xii.

Tallow:
Used as a flux
Banks and Morgan, 2.
Morewood and Whytock, 16.

Tartaric acid (*hydric tartrate*)**:**
Used in a depositing solution;
Weil, 44.
Weil, xii.

"Terne" plates:
Davies, Jones, and Jones, 85 (*Appendix*).
Taylor and Price, 8.
Kelly and Shakespeare, 9.
Madge, 17.
Morewood, 27.
Tomkins, 30.
Saunders and Piper, 31.
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Saunders and Piper, 52.
Saunders and Piper, 60.
Morewood, 65.

Thallium, electro-deposition of; deposition of thallium upon zinc; also sulphate of:
Crookes, xii.

Tin, coating metals and alloys with:
By electro-deposition;
Brooman (*Miller*), 10.
Fearn and Cox, 13.
Beslay, 20.
Weil, xii.
Webster, 62.

Tin, &c.—*cont.*

- By heat;
  - Bent, 67 (*Appendix*).
  - Alston, 69 (*Appendix*).
  - Alderson, 71 (*Appendix*).
  - Warner, 78 (*Appendix*).
  - Warner, 79 (*Appendix*).
  - Cornforth, 80 (*Appendix*).
  - Bennett, 10.
  - Johnson (*Sebille*), 19.
  - Newton (*Hamon*), 37.
  - Putnam, 41.
- By immersion of the article to be coated in a bath of molten tin;
  - Blakemore and James, 72 (*Appendix*).
  - Daniell, 72 (*Appendix*).
  - Morewood, 74 (*Appendix*).
  - Davies, Jones, and Jones, 85 (*Appendix*).
  - Banks and Morgan, 2.
  - Taylor and Price, 8.
  - Kelly and Shakespeare, 9.
  - Morewood and Whytock, 16.
  - Madge, 17.
  - Nurse and Nurse, 21.
  - Claus, 24.
  - Morewood, 27.
  - Harrison, 27.
  - Jones, 30.
  - Tomkins, 30.
  - Saunders and Piper, 31.
  - Morgan, 32.
  - Knight, 34.
  - Deane, 37.
  - Johnson (*Girard*), 38.
  - Leyshon, 46.
  - Thompson, 49.
  - Jenkins, 51.
  - Saunders and Piper, 52.
  - Saunders and Piper, 60.
  - Morewood, 65.
- By various processes;
  - Maybury, Maybury, and Maybury, 73 (*Appendix*).
  - Chavasse, Morris, and Haines, 14.
  - Kinder, 33.
  - Shaw, 35.
  - Russ, 42.
  - Fowler, 48.
  - Bonneville (*De Nozan*), 54.

Tin, salts of. *See*, Chloride of tin.

Treating products obtained when coating iron with zinc:

- Graham, 50.
- Crockford, 65.

White lead (*lead carbonate*):

- Used as a flux;
  - Bagley and Mincher, 1.
  - Clark (*Holley*), 36.

Wires used in musical instruments:

- Gilding them;
  - Bisseker, 81 (*Appendix*).

Zinc, coating metals or alloys with:

- By various purposes;
  - Berry, 74 (*Appendix*).
  - Morewood, 74 (*Appendix*).
  - Warner, 78 (*Appendix*).
  - Warner, 79 (*Appendix*).
  - Graham, 5.
  - Johnson, 14.
  - Chavasse, Morris, and Haines, 14.
  - Harrison, 27.
  - Tomkins, 30.
  - Johnson (*Girard*), 38.
  - Putnam, 41.
  - Weil, 44.
  - Webster, 62.
  - Bousfield (*Perkins*), 63.

Zinc, coating or covering:

- With alloys;
  - Cornforth, 80 (*Appendix*).
  - Bagley and Mincher, 1.
  - Chavasse, Morris, and Haines, 14.
- With copper;
  - Cornforth, 80 (*Appendix*).
  - Oudry, 84 (*Appendix*).
  - Wall, 84 (*Appendix*).
  - Bousfield (*Walcott*), 11.
  - Johnson (*Oudry*), 21.
  - Boettger, xiv.
- With lead;
  - Bagley and Mincher, 1.
- With mercury;
  - Wall, 84 (*Appendix*).
- With metals in general;
  - Weems, 12.
  - Chavasse, Morris, and Haines, 14.
- With silver;
  - Cornforth, 80 (*Appendix*).
- With tin;
  - Cornforth, 80 (*Appendix*).

Zinc, salts of. *See*, Chloride of zinc; Muriatic acid saturated with zinc; and Sulphate of zinc.

Zinc used to reduce copper from its solution:

- Webster, 86 (*Appendix*).

Zinc used to reduce indium from its solution;

- Winckler, xiv.
- Schrötter, xiv.

ERRATA.

Since the publication of the first volume of the present series of Abridgments the following errata have been discovered therein:—

Page 19, line 26 from top, *for* "August 3," *read* "October 18."
" 103, " 11 from top, *for* "Etitjean" *read* "Petitjean."

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Heywood (*Mechanics' Institute*).

Holbeck (*Mechanics' Institution*).

Hollingwood (*Working Men's Club*).

Holywell Green (*Mechanics' Institution*).

Huddersfield (*Mechanics' Institution*).

Hull (*Church Institute*).

—— (*Literary, Scientific and Mechanics' Institute*).

—— (*Lyceum Library*).

—— (*Royal Institution, Albion Street*).

—— (*Young People's Institute*).

Huntingdon (*Literary and Scientific Institution*).

Kendal (*Christian and Literary Institute*).

—— (*Working Men's Institute*).

Kidderminster (*Mechanics' Institute*).

Lancaster (*Mechanics' Institute and School of Science*).

Leeds (*Church Institute*).

—— (*Library*).

—— (*Mechanics' Institution and Literary Society*).

—— (*Philosophical and Literary Society*).

—— (*Working Men's Institute*).

—— (*Young Men's Christian Association*).

Leighton Buzzard (*Working Men's Mutual Improvement Society*).

Leith (*Mechanics' Subscription Library*).

Lewes (*Mechanics' Institute*).

—— (*School of Science and Art*).

Lincoln (*Mechanics' Institute*).

Liverpool (*Institute*).

—— (*Mechanics' Institute*).

Liverpool (*Medical Institution*).
—— (*Polytechnic Society*).
Llanelly (*Chamber of Commerce and Reading Room*).
London (*Athenæum Club, Pall Mall*).
—— (*Beaumont Institute, Mile End*).
—— (*Bedford Working Men's Institute, Spitalfields*).
—— (*Birkbeck Institution, Southampton Buildings, Chancery Lane*).
—— (*Bow Common Working Men's Club, Devon's Road, Bow Common*).
—— (*Christchurch Working Men's Club, New Street, Lark Hall Lane, Clapham*).
—— (*Clerkenwell Club, Lower Rosoman Street*).
—— (*Holloway Working Men's Club and Institute, Holloway Road*).
—— (*Literary and Scientific Society, Wellington Street, Islington*).
—— (*Literary and Scientific Institution, Walworth*).
—— (*St. James and Soho Working Men's Club, Rupert Street, Soho*).
—— (*St, Mary Charterhouse Working Men's Club, Golden Lane*).
—— (*South London Working Men's College, Blackfriars Road*).
—— (*Southwark Working Men's Club, Broadwall, Stamford Street*).
—— (*Working Men's Club, Brixton Hill*).
—— (*Working Men's Club, St. Mark's, Victoria Docks*).
—— (*Working Men's Club and Institute, Battersea*).
—— (*Working Men's Club and Institute Union, Strand*).
—— (*Working Men's College, Great Ormond Street*).
Loughborough (*Working Men's Club and Institute*).
Madeley (*Anstice Memorial, Workmen's Club and Institute*).
Manchester (*Ancoats Branch Free Library*).
—— (*Athenæum*).
—— (*Campfield Free Lending Library*).
—— (*Chorlton and Ardwick Branch Free Library*).
—— (*Hulme Branch Free Library*).
—— (*Law Library*).
—— (*Mechanics' Institution*).
—— (*Natural History Museum, Peter Street*).
—— (*Owen's College*).
—— (*Portico Library, Moseley Street*).
—— (*Rochdale Road Branch Free Library*).
—— (*Royal Exchange Library*).
Mansfield (*Co-operative Industrial Society*).
—— (*Mechanics', Artizans', and Apprentices' Library*).
Melksham (*Mutual Improvement Society*).
Merthyr-Tydfil (*South Wales Institute of Engineers*).
Middlesborough (*Iron and Steel Institute*).
—— (*Mechanics' Institution*).
Modbury (*Mechanics' Institution*).
Mossley (*Mechanics' Institute*).
Newark (*Mechanics' Institute*).
Newcastle-upon-Tyne (*Mechanics' Institution*).
—— (*Working Men's Club*).
New Mills, near Stockport (*Mechanics' Institute*).
Newport, Isle of Wight (*Young Men's Society and Reading Room*).
Northampton (*Mechanics' Institute*).
Nottingham (*Free Library*).
—— (*Mechanics' Institution*).
—— (*Subscription Library, Bromley House*).
Oldham (*Analytic Literary Institution*).
—— (*Mechanics' Institution, Werneth*).
Ormskirk (*Public Library*).
Oswestry (*Institute*).
Patricroft (*Mechanics' Institution*).
Pembroke Dock (*Mechanics' Institute*).
Pendleton (*Mechanics' Institution*).
Penryn (*Working Men's Club and Reading Room*).
Perth (*Mechanics' Library, High Street*).
Peterborough (*Mechanics' Institution*).
Plymouth (*Working Men's Institute*).
Poole (*Literary and Scientific Institution*).
—— (*Mechanics' Institute*).
Portsea (*Athenæum and Mechanics' Institution*).
Preston (*Institution for the Diffusion of Knowledge*).
Rawtenstall (*Mechanics' Institution*).
Richmond (*Working Men's College*).
Rotherham (*Rotherham and Masbro' Literary and Mechanics' Institute*).
Royston (*Institute*).
Ryde, Isle of Wight (*Philosophical and Scientific Society*).
Saffron Walden (*Literary and Scientific Institution*).
St. Just (*Institution*).
St. Leonard's (*Mechanics' Institution*).
Salford (*Working Men's Club*).
Saltaire (*Literary Institute*).
Selby (*Mechanics' Institute*).
Sheffield (*Branch Free Library*).
—— (*Literary and Philosophical Society, School of Arts*).
Skipton, Yorkshire (*Mechanics' Institute*).
Southampton (*Hartley Institution*).
—— (*Polytechnic Institution*).
Southport (*Athenæum*).

South Shields (*Working Men's Institute and Club*).
Spalding (*Mechanics' Institute*).
——— (*Christian Young Men's Association*).
Staines (*Literary and Scientific Institution*).
——— (*Mechanics' Institute and Reading Room*).
Stamford (*Institution*).
Stourbridge (*Church of England Association*).
——— (*Iron Works Reading Room and Library*).
——— (*Mechanics' Institution*).
——— *Working Men's Institute*).
Stratford (*Working Men's Hall*).
Sunderland (*Working Men's Club*).
Swansea (*Royal Institution of South Wales*).
——— (*Working Man's Institute*).
Tavistock (*Mechanics' Institute*).
——— (*Public Library*).
Thornton, near Bradford (*Mechanics' Institute*).
Thornton Heath, Croydon (*Workmen's Club*).
Todmorden (*Mechanics' Institution*).
Truro (*Cornwall County Library*).
——— (*Institution*).
——— (*Royal Institution of Cornwall*).
Tunbridge Wells (*Mechanics' Institution*).
——— (*Society of Literature and Science*).
Turton near Bolton (*Chapel Town Institute*).
Tynemouth (*Free Public Library*).
Ulverston (*Temperance Hall*).
Uttoxeter (*Mechanics' Literary Institute*).
Wakefield (*Mechanics' Institute*).
Watford (*Literary Institute*).
Wells, Somerset (*Mechanics' Institution, Grove Lane*).
——— (*Young Men's Society*).
Whaleybridge (*Mechanics' Institute*).
Whitby (*Institute*).
——— (*Museum*).
——— (*Subscription Library*).
Whitehaven (*Mechanics' Institute*).
——— (*Working Men's Reading Room*).
Whitstable (*Institute*).
Wisbeach (*Mechanics' Institute*).
Witham (*Literary Institution*).
Wolverhampton (*Library*).
Wolverton (*Institute*).
Woodbridge (*Literary and Mechanics' Institute*).
——— (*Working Men's Hall*).
Worcester (*Railway Literary Institute*).
——— (*Workman's Hall*).
Workington (*Mechanics' Institution*).
York (*Church Institute*).
——— (*Institute of Popular Science &c.*)
——— (*Railway Library*).

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———— Odd Fellows' Library Association, San Francisco.

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B. WOODCROFT.

July 10, 1871.

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